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FINAL REMEDIAL INVESTIGATION REPORT SITE 28 NSWC INDIAN HEAD MD
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CH2MHILL

Final

Remedial Investigation Report
Site 28

Naval District Washington, Indian Head
Indian Head, Maryland

Contract Task Order 0111

April 2005

Prepared for

Department of the Navy
Atlantic Division
Naval Facilities Engineering Command

Under the

LANTDIV CLEAN II Program
Contract N62470-95-D-6007

Prepared by

CH2MHILL

Herndon, Virginia

Executive Summary

Introduction

This report describes the work performed for and the results of the remedial investigation (RI) conducted at Site 28 at Naval District Washington, Indian Head (NDWIH), in Indian Head, Maryland. The RI was performed by CH2M HILL for the Atlantic Division of the Naval Facilities Engineering Command, Department of the Navy, as Contract Task Order 0111 under U.S. Navy Contract N62470-95-D-6007.

Objectives and Scope of Work

The objectives of the RI (CH2M HILL, 2003) were to:

- Verify the presence of contamination in soil, groundwater, surface water, and sediment resulting from past activities at the site
- Define the extent of contamination
- Evaluate the need for remediation on the basis of the information developed in the human health and ecological risk assessments

Site Background

Site 28 is in the northeast corner of the facility, on the shore of Mattawoman Creek. The site encompasses the former site of a zinc recovery furnace, Well 14, and a shoreline burning cage. In 1928, the zinc recovery furnace, designated Building 415, was erected. The last station map on which the building appears is dated October 31, 1952, indicating that the building was demolished in the early 1950s (Dolph, 2001).

Site Findings

- As expected, the area around the former zinc recovery furnace contains significant metals contamination, especially zinc
- The concentrations of metals are significantly higher in the surface soils than the subsurface soil (1–3 ft deep)
- Significant metals contamination, especially from zinc, was also present in the sediment downgradient of the former zinc recovery furnace

Conclusions and Recommendations

The analytical results have adequately defined the nature and extent of the contamination for each medium. The number of samples taken was adequate to determine the extent of contamination at the site. None of the media contain volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), or chemicals used in explosive devices in significant quantities to be of concern. All risk drivers at the site are metals.

The human health risk assessment determined that potentially unacceptable risk was present for future adults, children, lifetime residents, and construction workers exposed to soil and groundwater at Site 28. Risks to commercial and industrial workers from soil were not quantitatively evaluated in the risk assessment. However, based on the calculated risk to an adult resident exposed to soil (i.e., a noncarcinogenic hazard that only marginally exceeded the USEPA target hazard level), which is the most directly analogous receptor to a commercial worker, the potential risk to this receptor is likely acceptable. The analysis of the elevated lead concentrations in the Swale 3 area (Figure 6-2) concluded that exposure to surface soil and subsurface soil in this area would potentially be a concern for fetuses of expectant construction workers, utility workers (if they are exposed at the upper end of the estimated range of parameter values), and adult trespassers (if they are exposed at the upper end of the estimated range of parameter values), and for future child residents. None of these receptors are present at the site under current conditions, nor are they expected to be present at the site in the future.

The screening ecological risk assessment determined that potentially unacceptable risk was present in the soil and sediment. A Baseline Ecological Risk Assessment (BERA) is currently underway to address potential ecological risks.

The recommendation for metals-contaminated soil in the Swale 3 area at Site 28 is to evaluate soil removal as an interim remedial measure (IRM). This IRM will include removal of soil to a depth and extent that will mitigate the potential risks to both human and ecological receptors from soil at Site 28. The BERA will evaluate the potential ecological risks from sediment, surface water, and groundwater-to-surface water exposure at Site 28. Based on the results of the BERA, these pathways may need to be addressed in a Feasibility Study.

While risks from groundwater to human receptors are estimated to be potentially unacceptable, groundwater is not recommended for advancement in the CERCLA process to the feasibility study stage. Given the proximity of Site 28 to Mattawoman Creek, low hydraulic conductivity, and the very thin saturated thickness, shallow groundwater in the vicinity of Site 28 is not a potable resource. One could not build a legal well in this unit, given Maryland well construction regulations, which require a minimum of 20 feet of isolation casing from ground surface. This unit is also not capable of meeting sustained yield requirements of Maryland well construction regulations; a well casing greater than 200 feet would likely be required.

Risk from groundwater to ecological receptors will be evaluated in the Site 28 BERA because groundwater does migrate to surface water swales and the Mattawoman Creek system. Groundwater is also a potential source of metals to the near-shore sediments and surface water and thus will be considered in the management of ecological risk for these media. The BERA will be completed prior to the Site 28 Feasibility Study.

Also, shoreline habitat is expected to be restored as part of any remedial action, as the current conditions are degraded and active erosion is occurring.

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Abbreviations and Acronyms

AET	Apparent Effect Threshold
AWQC	ambient water quality criteria
BERA	baseline ecological risk assessment
BCF	bioconcentration factors
bgs	below ground surface
BSIR	Background Soil Investigation Report (Tetra Tech NUS, 2002)
BTAG	Biological Technical Assistance Group
CEC	cation exchange capacity
COC	chemical of concern
COPC	chemical of potential concern
CSF	cancer slope factor
CTE	central tendency exposure
DAF	dilution-attenuation factor
DOC	dissolved organic carbon
DPT	direct-push technology
EPC	Exposure Point Concentration
ERA	ecological risk assessment
ESADDI	"estimated safe and adequate daily dietary intake"
HEAST	health effects assessment summary table
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
HSA	hollow-stem auger
IAS	Initial Assessment Study
IDW	investigation-derived waste
IEUBK	Integrated Exposure Uptake Biokinetic
IR	installation restoration
IRIS	Integrated Risk Information System
IRM	Interim Remedial Measure
K_{oc}	organic carbon partition coefficient
K_{ow}	octanol-water partition coefficient
LMS	linearized multistage
LOAEL	lowest-observed-adverse-effect level
MCL	maximum contaminant level
MILCON	military construction
msl	mean sea level
MTBE	methyl-tert-butyl ether

NACIP	Navy Assessment and Control of Installation Pollutants
NCEA	National Center for Environmental Assessment
NDWIH	Naval District Washington, Indian Head
NEESA	Naval Energy and Environment Support Activity
NG	nitroglycerine
NOAEL	no-observed-adverse-effect level
NOS	Naval Ordnance Station
NPL	National Priorities List
NQ	nitroguanidine
NWI	National Wetland Inventory
ORP	oxidation-reduction potential
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PETN	pentaerythritol tetranitrate
ppb	parts per billion
ppm	parts per million
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
RBC	risk-based concentrations
RCRA	Resource Conservation and Recovery Act
RDA	recommended dietary allowance
RfD	reference dose
RI	remedial investigation
RME	reasonable maximum exposure
SERA	screening-level ecological risk assessment
SI	site inspection
SPAWARS	Space and Naval Warfare Systems Command
SQL	sample quantitation limit
SSL	soil-screening level
SVOC	semivolatile organic compounds
TAL	Target Analyte List
TCL	Target Compound List
TIE	Toxicity Identification Evaluation
TOC	total organic carbon
UCL	upper confidence limit
UF	uncertainty factor
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
UTL	upper tolerance limit
VOC	volatile organic compound

SECTION 1

Introduction

This report describes the work performed and the results of the remedial investigation (RI) conducted at Site 28 (also referred to as the "Original Burning Ground," the "Slavins Dock Area," and the "Wildlife Area") at the Naval District Washington, Indian Head (NDWIH)[1] in Indian Head, Maryland. The RI was performed by CH2M HILL for the Atlantic Division of the Naval Facilities Engineering Command, Department of the Navy, as Contract Task Order 0111 under U.S. Navy Contract N62470-95-D-6007.

1.1 Objectives and Scope of Work

The objectives of the RI (CH2M HILL, 2003) were to:

- Verify the presence of contamination in soil, groundwater, surface water, and sediment resulting from past activities at the site
- Define the extent of contamination
- Evaluate the need for remediation on the basis of the critical information developed in the human health and ecological risk assessments

These objectives were established on the basis of a review and evaluation of site historical information (Dolph, 2001).

These objectives were pursued through the following field and laboratory activities: (1) collection and analysis of surface and subsurface soil samples; (2) collection and analysis of in situ groundwater samples (direct push) to determine placement of monitoring wells; (3) collection and analysis of surface water and sediment in the swales and collection of sediment samples in Mattawoman Creek; and (4) installation and sampling of permanent monitoring wells during phase two of the field effort.

The in situ groundwater (direct-push) data were presented at the July Indian Head Installation Restoration Team meeting. During this meeting and a series of conference calls, the monitoring well locations were agreed upon by the Team and installed. All of the soil data, sediment data, and groundwater data collected from monitoring wells have undergone a full data validation. These data were then evaluated for human health and ecological risk.

1.2 Report Organization

This report summarizes the data collected during the RI, interprets the data, and documents the nature and extent of contamination for affected media. Contaminant-migration pathways and transport mechanisms for affected media are evaluated. The report also

[1] On October 1, 2003, the installation management functions at Indian Head transferred from NDWIH to NDW. References to this installation will now be Naval District Washington, Indian Head.

presents an assessment of the potential human-health and environmental risks associated with current site conditions and recommendations for further activities at the site.

The report is divided into eight sections and supplemented by appendices:

1. **Introduction:** Describes the objectives and scope of the RI, the organization of the report, the activity, and the history of Site 28
2. **Activity and Site Physical Description:** Summarizes the physical characteristics of the facility and Site 28
3. **Remedial Investigation Activities:** Provides details of the sampling and data-gathering methods used during the field activities. The sampling rationale and data-quality objectives as dictated by the intended use of the data are discussed in this section. The quality assurance (QA) and quality control (QC) protocols followed during the RI activities also are provided in this section
4. **Nature and Extent of Contamination:** Describes the nature and extent of contamination found in soil, surface water, sediment, and groundwater from the RI activities
5. **Contaminant Fate and Transport:** Describes contaminant migration at the site in the context of the mobility and persistence of the contamination
6. **Human Health Risk Assessment:** Describes the potential effects of the contamination on human health
7. **Ecological Risk Assessment:** Describes the potential effects of the contamination on the environment
8. **Conclusions and Recommendations:** Summarizes the results of the RI and the risk posed to human health and the environment based on the nature, extent, fate, and transport of contaminants on the site and provides recommendations for additional work

The appendixes contain the soil-boring and well-construction logs, well permits, well-location and well-elevation survey data, the raw analytical data obtained during the RI investigations, and the human-health and environmental risk assessment tables of calculations.

1.3 Activity Description

1.3.1 Introduction

NDWIH is a military facility located in northwestern Charles County, Maryland, approximately 25 miles southwest of Washington, D.C. (Figure 1-1). The facility consists of two tracts of land: the main installation, on the Cornwallis Neck Peninsula, and the Stump Neck Annex, located across Mattawoman Creek (Figure 1-2).

The main installation comprises approximately 2,500 acres and is bounded by the Potomac River to the northwest, west, and south; Mattawoman Creek to the south and east; and the town of Indian Head to the northeast (Figure 1-2). Included as part of the main installation

are Marsh Island and Thoroughfare Island, which are located in Mattawoman Creek. Elevations range from sea level to approximately 125 ft above mean sea level (msl).

The Stump Neck Annex comprises approximately 1,000 acres and is bounded by the Mattawoman Creek, the Potomac River, and the Chicamuxen Creek (Figure 1-2). Elevations range from sea level to approximately 10 ft above msl.

Both Cornwallis Neck Peninsula and Stump Neck Annex are on the National Priorities List (NPL). The main installation and Stump Neck Annex are separated by Mattawoman Creek (i.e., are noncontiguous), have separate U.S. Environmental Protection Agency (USEPA) identification numbers, and perform dissimilar operations. Investigation of the Stump Neck Annex is being conducted through the Resource Conservation and Recovery Act (RCRA) Corrective Action and the Installation Restoration (IR) program. Site 28 is located at the easternmost point of the main installation, along the shore of the Mattawoman Creek.

1.3.2 Current and Historical Uses of NDWIH

NDWIH was established in 1890 and is the Navy's oldest continuously operating ordnance station. At various times during its operation, NDWIH served as a gun and armor proving ground, a powder factory, a propellant plant, and a research facility. The U.S. government purchased Stump Neck Annex in 1901. The property provided a safety buffer for testing larger naval guns that were fired into the Potomac River and at Stump Neck.

The original NDWIH installation was enlarged by the acquisition of 1,160 acres of adjacent land in 1918, during World War I. This expansion included the purchase of Hopewell Farm and Hog Island, which was then an islet in Mattawoman Creek and has since become attached to the Cornwallis Neck peninsula. When the Dahlgren Naval Proving Ground was established as a separate command in 1932, NDWIH was redesignated the Naval Powder Factory (Parsons Engineering Science, Inc., 2000).

Facility missions, including producing gunpowder and developing new explosives during World War II, resulted in the construction of several new facilities at NDWIH, as well as the construction of Route 210 (Indian Head Highway) as a Defense Access Road in 1943. Development and improvements at Indian Head continued throughout the 1950s and 1960s, and in 1966, NDWIH was renamed the Naval Ordnance Station (NOS). Rum Point, an 80-acre promontory in Mattawoman Creek near Stump Neck, was also acquired in this year. Bullitt Neck was obtained in five small acquisitions during 1965 and 1966 in order to meet safety and security needs arising from explosive magazines at the Indian Head station (Parsons Engineering Science, Inc., 2000).

After the Vietnam conflict, the mission of NDWIH shifted from production to a highly technical engineering support operation. In 1987, NOS was established as a Center for Excellence to promote technological excellence in the following specialized fields: energetic chemicals; guns, rockets, and missile propulsion; ordnance devices; explosives; safety and environmental protection; and simulators and training (Parsons Engineering Science, Inc., 2000). Current military land use includes operations and training; production; maintenance and utilities; research, development, testing, and evaluation; explosive storage; supply and nonexplosive storage; administration; community facilities and services; and housing.

Forest stands compose approximately 47 percent, or 1,603 acres, of NDWIH and include pine, pine-hardwood, and hardwood forest cover types. Recreation areas at Indian Head include approximately 1,150 acres of designated hunting areas, approximately 2 miles of shoreline fishing areas, and 1.5 miles of nature trails.

1.3.3 Surrounding Land Uses

NDWIH is generally surrounded by commercial, residential, and state park land to the east and south of the main installation and Stump Neck Annex. The town of Indian Head is located just east of NDWIH, where most residential developments are located. Indian Head Highway extends eastward from the NDWIH main gate, attracting businesses and providing access to residential areas off the main highway. The Potomac River borders the main installation to the north and west and Stump Neck to the west. Mason Neck National Wildlife Refuge is located across the Potomac River, north of the main installation. The Mattawoman Natural Environment Area is state-owned property located along the southern edge of Mattawoman Creek east of the main installation.

The Stump Neck Annex is bordered to the north by Mattawoman Creek, to the east by General Smallwood State Park and Sweden Point Marina, and to the south by Chicamuxen Creek, agricultural lands, and low-density residential development. The Chicamuxen Wildlife Management Area is located adjacent to and south of the Stump Neck Annex.

1.4 Previous Investigations

In 1983, Naval Energy and Environment Support Activity (NEESA) conducted an Initial Assessment Study (IAS) to evaluate sites at the NDWIH and to determine if a potential threat to human health or the environment existed. The findings for Site 28 are provided in the IAS report, in which the 1.8-acre site was referred to as the "original NOS burning ground." File searches did not provide information about the types of materials that were burned. NEESA concluded on the basis of materials manufactured when the site was in operation, c. 1890 to 1942, that smokeless powder may have been burned at the site. Various contaminated wastes were also burned openly. During IAS site reconnaissance, no signs of burned materials were observed. NEESA concluded that there was not enough information to characterize the potential hazard of the site. The site was not recommended for a Navy Assessment and Control of Installation Pollutants Confirmation Study.

Several soil sampling events were conducted following the IAS. In August 1993, a soil sample from Site 28, referred to at that time as the "Slavins Dock area," was collected about 20 ft southwest of "Well #14" (Figure 1-3) and analyzed for soil texture, pH, and fertility. The pH for the sandy loam soil was 6.7. The soil test results indicated that copper, magnesium, sulphate, and zinc were present in amounts of 25, 30, 22.7, and 14,700 pounds per acre, respectively. For zinc, this translates into 7,350 parts per million (ppm).

In May 2000, the analytical results of total lead and total zinc in a soil sample (soil sample 1) collected from Site 28 near "Wildlife Area Well #14" indicated concentration levels of 9.37 and 515 ppm, respectively. In July 2000, a soil sample (IR2855-000712) was collected and analyzed for various metals. The analysis detected cadmium (1.2 ppm), lead (3.8 ppm), and selenium (1.8 ppm) in the sample.

In October 2000, a sediment sample was collected in Mattawoman Creek just off the shoreline of Site 28 for a Toxicity Identification Evaluation (TIE) associated with Site 42 (SAIC, 2001). The sediment sample had a measured pore water concentration of zinc of 25,000 micrograms per liter (μg/L).

TetraTech NUS's study of Mattawoman Creek included use of the Rapid Sediment Screening technology developed by Space and Naval Warfare Systems Command (SPAWARS) (Tetra Tech NUS, 2004). A review of the data collected for the Mattawoman Creek study indicated that additional site-specific data are required to evaluate the effect of Site 28 on the environment. Accordingly, additional sampling was performed (see Section 3).

1.5 Site 28 Overview

Site 28, also referred to variously as the "Original NOS Burning Ground," the "Slavins Dock Area," and the "Wildlife Area," is located on the main installation of NDWIH (Figure 1-2). The site encompasses the former site of a zinc recovery furnace, Well 14, and a shoreline burning cage (Figure 1-3).

During World War I, the U.S. Navy initiated a metal-recycling program, which was vital during World War II and continues to present day. In 1928, the zinc recovery furnace, designated Building 415, was erected. The last station map on which the building appears is dated October 31, 1952, indicating that the building was demolished in the early 1950s (Dolph, 2001).

Well 14 was installed in 1918 to a depth of 430 ft using cable drilling (Public Works of the Navy, date unknown). Initially this was used as a potable well, but it became an observation well in 1988 and remains so today.

A small burning cage to the south of Well 14 was used to burn debris (e.g., wooden crates). The exact location of the former burning cage is unknown. The burning ground is shown outside of the existing perimeter fence on at least one historical map; however, burned debris, glass, and slaglike materials were observed inside the fence in an area adjacent to the mouth of Swale 4 (Figure 1-3).

See Section 2 for more-detailed site information.

1.6 References

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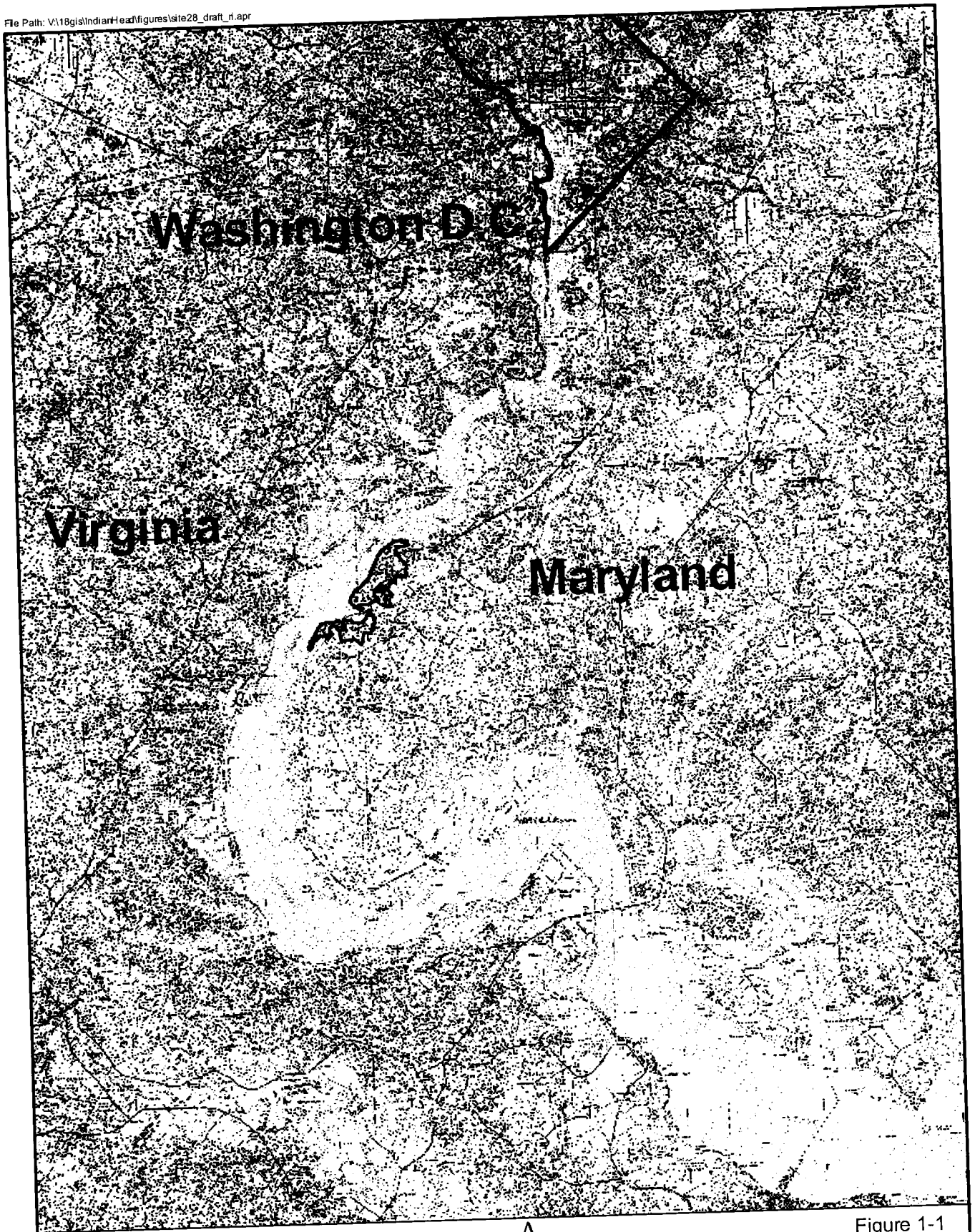

LEGEND

- Facility Boundary
- District of Columbia
- Water Bodies

N

0 20000 40000 Feet

Figure 1-1
Facility Location Map
Site 28 RI Report
IHDIV-NSWC, Indian Head, Maryland

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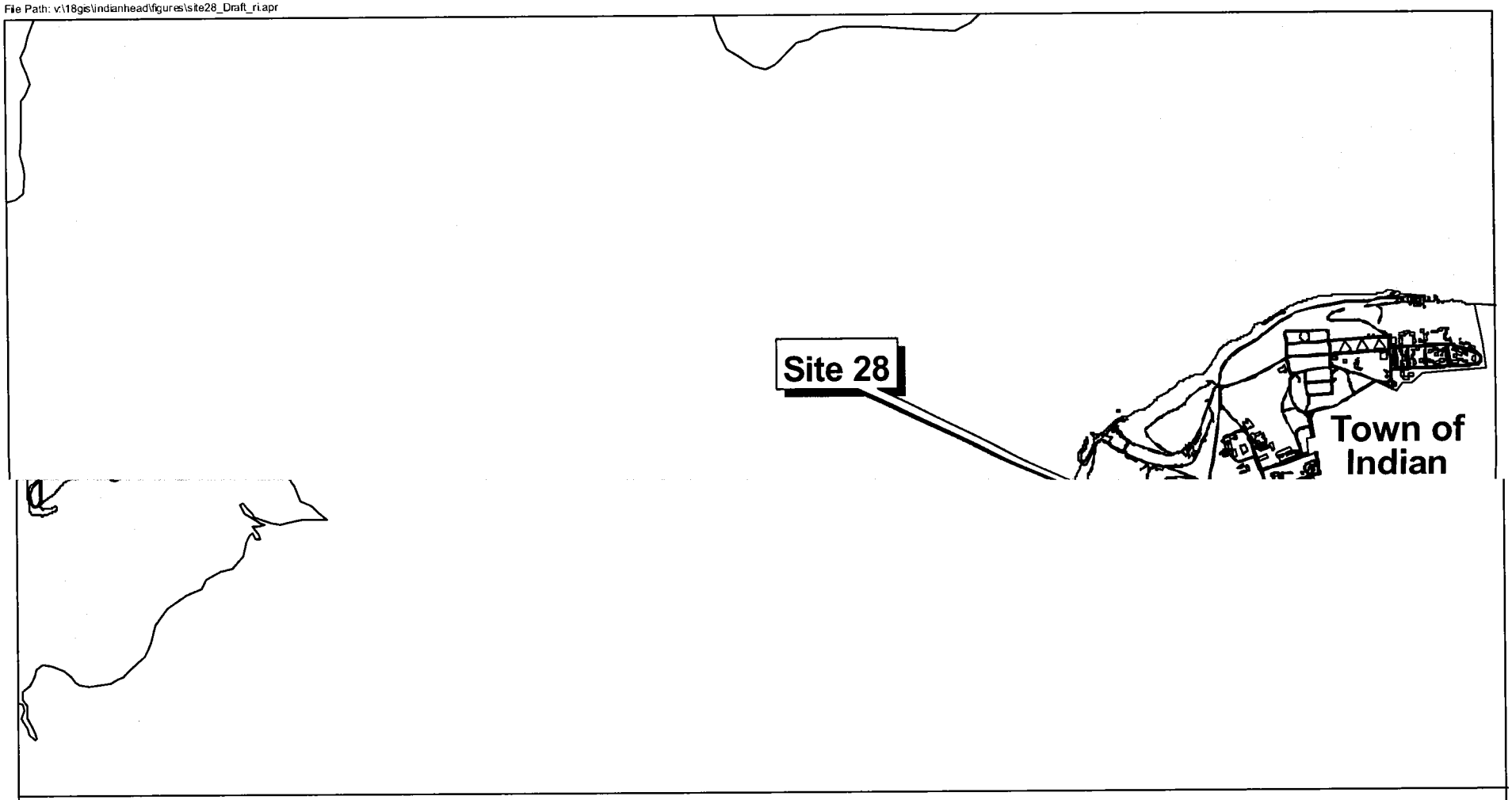

LEGEND

- IR Site Boundary
- Perennial Swale
- Intermittent Swale
- Railroads
- Buildings
- Asphalt Road
- Dirt Road
- Gravel Road

N

0 2500 5000 Feet

Figure 1-2
Base Map
Site 28 RI Report
NDWIH, Indian Head, Maryland

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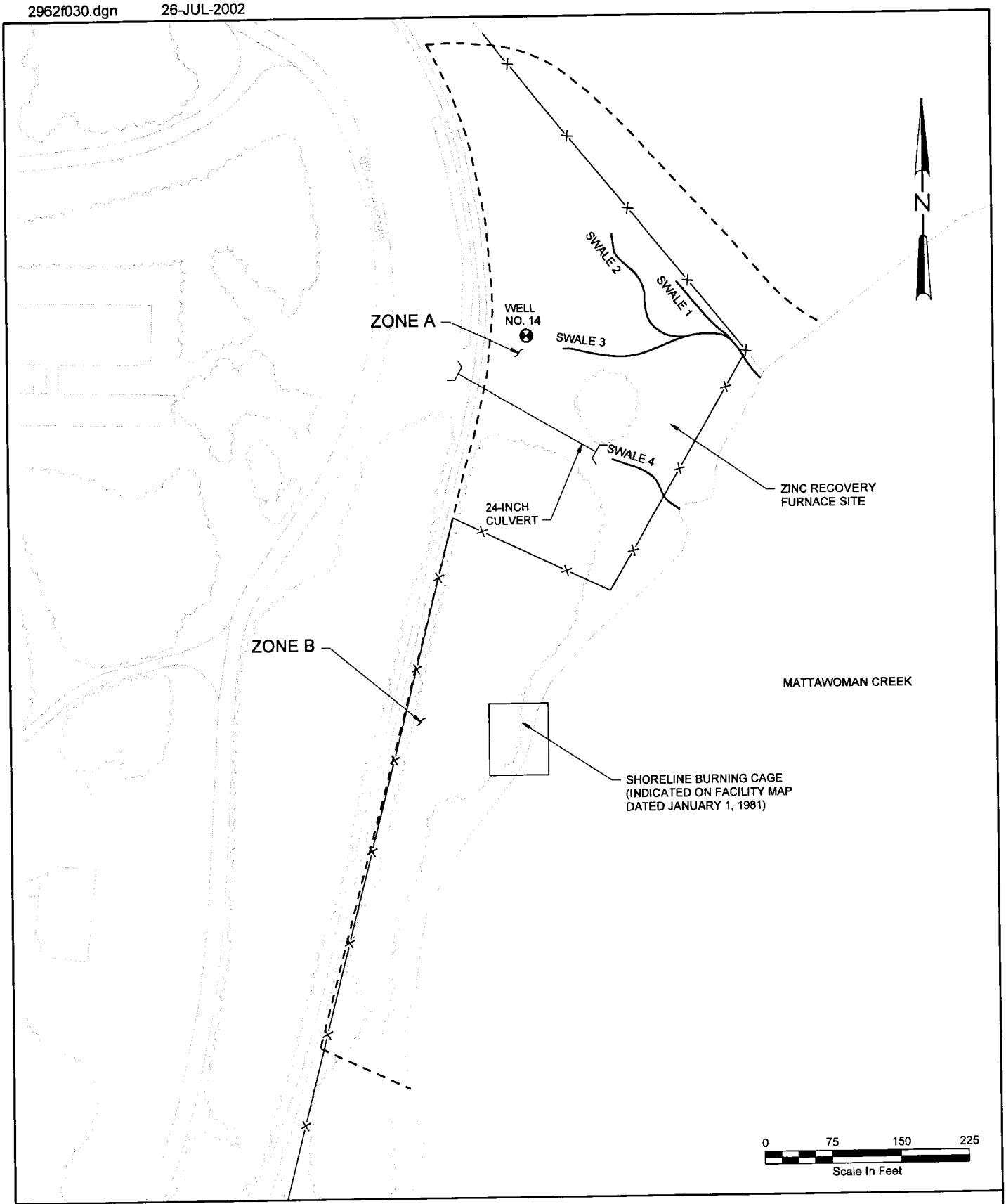

LEGEND

-X—X- FENCE LINE

– – – – APPROXIMATE SITE BOUNDARY FOR RI

NOTE: SWALE LOCATIONS ARE APPROXIMATE.

FIGURE 1-3
SITE 28
SITE 28 RI REPORT
NDWIH
INDIAN HEAD, MARYLAND

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SECTION 2

Activity and Site Background

This section discusses the physical characteristics of NDWIH and Site 28. Section 2.1 describes the topography and climate; Section 2.2 , the soils; Section 2.3, the hydrology; Section 2.4, the geology; Section 2.5, the hydrogeology; and Section 2.6, the ecology. A summary of ecological receptors and exposure pathways specific to Site 28 are presented in Section 7.

2.1 Climate and Topography

2.1.1 NDWIH Climate

The climate is typical of the humid temperate continental climatic zone in which the facility lies. This zone has hot, humid summers and relatively mild winters. Because of its proximity to the Potomac River and its tributaries, NDWIH experiences less extreme temperatures, higher precipitation, and higher humidity than inland areas. The average daily maximum temperature is 67.5°F, and the average daily minimum temperature is 45°F. The warmest part of the year is in late July, and the coldest is in late January and early February. The growing season is approximately 190 days, from mid-April through mid-October (USDA, 1974).

2.1.2 NDWIH Topography

NDWIH is situated on a peninsula that separates Mattawoman Creek from the Potomac River. The terrain is characterized primarily by gently sloping hills and valleys. Elevations range from sea level along the perimeter of the peninsula to approximately 125 ft above msl at the bluffs in the northeastern portion of the facility (Figure 1-2).

2.1.3 Site 28 Topography

The topography of Site 28 is characterized by a relatively steep slope from the southeast to just before the shoreline with Mattawoman Creek. The slope near the shoreline is moderately sloped to relatively flat. A dirt road, which used to be a railroad track, lies just north of the site. The elevation ranges from 47 ft above msl from the west along the dirt road to sea level at the shoreline with Mattawoman Creek (Figure 2-1). There are four swales on Site 28 that are moderately to deeply incised (Figure 2-1).

2.2 Soils

The soils at NDWIH consist of silty and sandy loams with minor amounts of gravel and tend to have low permeability and low shrink-swell potential. Four dominant soil associations are found at Indian Head (USDA, 1974):

- **Beltsville-Gravelly Land-Bourne:** Level to moderately sloping soils, moderately well-drained and loamy, and moderately deep. They also include dense, root-inhibiting fragipans and steep, gravelly soil materials.
- **Beltsville-Exum-Wickham:** Level to moderately sloping, moderately well-drained and well-drained loamy soils. Soils within this association are moderately deep, and include dense, root-inhibiting fragipans and steep, gravelly soil materials.
- **Evesboro-Keyport-Elkton:** Level to moderately sloping, excessively drained, sandy soils and moderately well-drained and poorly drained, level to gently sloping, loamy soils with clayey subsoil.
- **Bibb-Tidal Marsh-Swamp:** Level or nearly level, poorly drained soils, generally located on floodplains and in miscellaneous unclassified wetlands.

2.3 Hydrology

Major water bodies at NDWIH include the Potomac River, Mattawoman Creek, and Chicamuxen Creek. The Potomac River flows almost 400 miles from its headwaters in the Allegheny Mountains of West Virginia. Near NDWIH, the Potomac broadens and becomes saltier from the increased influence of the Chesapeake Bay. Salinity ranges from 0.01 to 3.0 parts per thousand near NDWIH, with the highest salinity values recorded during dry summer months. Mattawoman and Chicamuxen Creeks are tidal tributaries to the lower Potomac River. Chicamuxen Creek is more saline than Mattawoman Creek because it is more strongly influenced by the estuarine waters of the lower Potomac River.

The Potomac River bounds Cornwallis Neck to the north and northwest. Because of the peninsula's topography, most of the surface water drainage on Cornwallis Neck flows into Mattawoman Creek, which forms its southeastern boundary. Stump Neck Peninsula is bounded by Mattawoman Creek to the north, the Potomac River to the northwest, and partially by Chicamuxen Creek to the southeast.

2.4 Geology

2.4.1 NDWIH Geology

The facility is in the Atlantic Coastal Plain physiographic province. This province consists of an eastward-thickening wedge of interbedded sand and clay units that were deposited in fluvial and marine environments. The deposits range in age from Cretaceous, consisting of the Potomac Group, to Recent, consisting of the Upper Lowland Deposits, and in thickness from 650 to 900 ft (Vroblesky and Fleck, 1991).

According to the geologic map provided by Hiortdahl (1997), the site is immediately underlain by Quaternary deposits. Hiortdahl (1997) provides a geologic cross-section that indicates that the Quaternary deposits are approximately 100 ft thick in the vicinity of the site. They are of fluvial and estuarine origin as cut-and-fill deposits in paleochannels of the early Potomac River system. They generally consist of medium- to coarse-grained sand and gravel grading upward to silt and clay. Isolated cobbles and boulders may be found near the base of the deposits. The site inspection (Ensafe/Allen & Hoshall, 1994) reported that the

soil profile from the ground surface to a depth of about 8 ft below ground surface (bgs) consists of well-sorted, medium-grained sand.

Vroblesky and Fleck (1991) reported that the Patapsco Formation, the uppermost unit of the Cretaceous Potomac Group, immediately underlies the Quaternary deposits in the vicinity of the site. The top of the Patapsco is about 45 ft below msl. The Patapsco is characterized by layers of fine- to medium-grained sand and silt separated by thick layers of clay. Typically, the deposits within the Patapsco Formation grade from coarse-grained at the bottom to finer-grained at the top. The Patapsco was not encountered during the RI drilling.

The Patapsco is immediately underlain by the tough, massive clay of the Arundel Formation, which is then underlain by the medium- to coarse-grained sand of the Patuxent Formation. The Patuxent is subsequently underlain by gneissic, schistosic, and gabbroic bedrock.

2.4.2 Site 28 Geology

Site-specific geologic information was obtained from 41 direct-push soil boring locations and 5 monitoring well soil boring locations. Seven soil borings were advanced; however, only five monitoring wells were constructed. One soil boring was abandoned after drilling to a depth of 1 ft because groundwater was encountered at less than 1 ft bgs. The other soil boring was used for collection of a Shelby tube sample for hydraulic conductivity testing and not for lithologic description. Continuous split-spoon samples were collected at each location during direct-push and hollow-stem auger (HSA) drilling. Appendix A contains the HSA and direct-push boring logs.

The northeast section of Site 28 Zone A does not contain any vegetation and has been extremely eroded. The shallow subsurface geology in this area is characterized by moist light gray, highly plastic silty clay. The southern section of Zones A and B is characterized by fine-grained sand and silty sand with occasional trace clay. The soil on either side of the dirt road (old railroad tracks) contains fill and consists of fine to coarse sand and gravel. The entire site is underlain by dense, gray, highly plastic clay.

The depth to the clay ranges from 4 to 26 ft bgs, depending on surface. This unit is likely part of the Quaternary deposit. Figure 2-1 shows the locations of soil borings used to obtain geologic data and the location of two geologic cross-sections (A-A' and B-B'). Figure 2-2 presents cross-section A-A', oriented approximately northwest-southeast through the site. Figure 2-3 shows cross-section B-B', oriented approximately west-east through the site.

2.5 Hydrogeology

2.5.1 NDWIH Hydrogeology

The water table is recharged by precipitation that infiltrates the ground surface. Some of the water that runs off the surface of the ground at the sites flows to drainage ditches. These ditches then drain toward the Potomac River or toward Mattawoman Creek. The Master Work Plan (Brown and Root Environmental, 1997) reports that most natural drainage from the facility is to Mattawoman Creek.

Hiortdahl (1990) states that although there are numerous localized water-bearing systems within the Lowland Deposits, these water-bearing units are not used as a potable water source by the facility or on the Indian Head Peninsula. The main aquifer is a series of units within the Potomac Group; the Patapsco unit is nearest the ground surface.

The facility is the largest user of groundwater in the area and withdraws an average of 1 to 2 million gallons per day. Most of the production wells are screened in the Patapsco Formation. One production well, Well 16A, located near Building 1728, is screened in the Patuxent aquifer. This well is currently used for drinking water. MILCON Project P-160, titled "Water Systems Improvement," also includes new well installation and well repairs (Jorgensen, 2002).

Eleven production wells are in use at the facility at present. Hiortdahl (1990) reports that pumping in the Potomac Group aquifers has produced a cone of depression in the potentiometric surface that extends approximately 6 miles to the northeast and southwest and 2 to 3 miles to the northwest and southeast.

2.5.2 Site 28 Hydrogeology

As discussed in Section 2.4.2, the site is immediately underlain by fine-grained to silty sand that is underlain by a clay layer. The sand acts as the primary water-bearing unit and the underlying clay acts as a confining layer.

The water table was encountered at the site at depths ranging from approximately 0.85 ft bgs in IS28MW02 to approximately 12.72 ft bgs in IS28MW03 when measured on September 10, 2003. The groundwater lies at relatively low altitudes and the flow is to the southeast toward Mattawoman Creek. The groundwater elevation in feet above mean sea level for each of the monitoring wells is shown in Figure 2-4. The hydraulic gradient of the site is roughly 0.1.

Two Shelby tube samples were collected from the underlying clay layer to estimate its hydraulic conductivity. One Shelby tube was collected upgradient of the site at IS28MW04, and one was collected downgradient of the site at IS28MW07 (Figure 2-4). At both locations the clay was penetrated by approximately 2 ft. Laboratory hydraulic conductivity testing was performed on these samples using method ASTM D5084. The estimated geometric mean is 2.55×10^{-8} cm/sec (Table 2-1, Appendix B). These values reflect the very low permeability of this unit and its role as a confining layer. The conductivity test method used, ASTM D5084, typically requires four consecutive tests on a sample. The extremely low conductivity of the sample collected from boring IS28MW07 would have required an unreasonably long period of time for four tests. Consequently, the hydraulic analysis of this sample was terminated after one conductivity test. The sample, however, does conform to ASTM D5084.

Groundwater at Site 28 discharges to Mattawoman Creek, a tidal tributary of the Potomac River. Typically, when a hydrostratigraphic unit discharges to a tidal water body, its water table or potentiometric surface fluctuates in a harmonic motion. The fluctuation is a somewhat delayed and dampened reflection of the tidal fluctuation. The amplitude (or height) of the fluctuation generally decreases with increasing distance from the shoreline. The time lag between high tide and high water level in the hydrostratigraphic unit also increases with increasing distance from the shore. Typically, these influences take the form

of a pressure-front propagation, rather than large-scale penetration of surface water into groundwater bodies.

As Figure 2-4 indicates, the hydraulic gradient from Site 28 to the Mattawoman Creek is relatively steep (1:0.2), with the maximum groundwater elevation greater than the maximum mean high-tide value expected in this area. Accordingly, net groundwater flow is from Site 28 to the Creek. Short-term decreases in hydraulic gradient would occur only at the peak of the diurnal high-tide cycle and would be limited temporally, since the hydraulic conductivity of the aquifer provides resistance to penetrative flow. Therefore, there is little opportunity for reversal of groundwater flow, if any, since the rate of change in the aquifer is much slower than the rate of change in the tidal cycle. True reversals of groundwater flow, and the concomitant penetration of Creek water into the coastal groundwater system, would inherently be limited to the near-shore area, perhaps to the areas of Site 28 in which static groundwater elevations are less than 2 ft above msl. Within this zone, some mixing will occur. This phenomenon is not likely to exert a significant influence on contaminant fate and transport or to quantification of risks to human health and the environment, since the contaminants in soil and groundwater in the near-shore area would still be transported into the Mattawoman system absent tidal interactions. The magnitude of these influences is expected to be small, given the relative differences in hydraulic head and Potomac River/Mattawoman Creek stage (28 ft above msl for wells in the vicinity of the topographically upgradient areas of Site 28, compared to near 0 ft above msl for the Potomac River/Mattawoman Creek).

Accordingly, any tidal influences at Site 28 likely are limited to the near-shoreline area.

Four swales at Site 28 discharge to Mattawoman Creek. Swale 4 flows perennially and is unaffected by drought conditions or seasonal fluctuations, suggesting an anthropogenic source, according to anecdotal evidence provided by NDWIH. Flow in the remaining three swales is intermittent, responding to seasonal fluctuations, and appears to be groundwater discharging to the ground surface as springs.

Possible anthropogenic sources of the Swale 4 water included losses from lines associated with Well 14 or leakage from a pressurized hydrant system that draws its water from the Potomac River. Investigation by NDWIH and CH2M HILL personnel determined that Well 14 was inoperable, with no electrical service, and therefore no active pumping. The base public works department was unable to find a hydrant system leak in the vicinity of Site 28.

As a secondary investigation of the water source, certain general water quality parameters (pH, specific conductance, and oxidation-reduction potential (ORP)) in groundwater, surface water (Mattawoman Creek), and the swale water were compared. The objective was to determine if the geochemical signature of the swale water more closely matched nearby groundwater conditions or Mattawoman Creek conditions (as a surrogate for and source of the hydrant system water). Mattawoman Creek measurements were based on U.S. Geological Survey (USGS) monitoring of surface water quality in Mattawoman Creek (at a point 12.6 river miles upstream of its mouth, near Pomonkey, Md.) during the period from December 6, 2003, through January 6, 2004. This is, at best, a screening analysis, since surface water conditions likely change downgradient, closer to the Mattawoman Creek intakes for the hydrant system. Water leaking from any upgradient sources would also have

to move through the unsaturated and saturated soil at Site 28, which would alter its geochemical signature. Both of these factors introduce uncertainty into the analysis.

The specific conductance value measured in Swale 4 was 101 µS/cm. This measurement is consistent with Swales 1, 2, and 3, which ranged from 104 to 226 µS/cm. The specific conductance values measured in the swales are also consistent with those measured in groundwater, which ranged from 109 to 263 µS/cm. USGS monitoring indicates that the specific conductance baseline ranges between 100 and 110 µS/cm in Mattawoman Creek. Although precipitation events affect this, baseline conditions appear to reestablish rapidly. The broad range of values measured in groundwater and swale water are very similar, suggesting a groundwater source, in contrast to the narrow range of specific conductance measured in surface water. Values of pH in groundwater range from 3.34 to 7.30; in swale water from 5.55 to 6.64; and in Mattawoman Creek from 6.2 to 6.7. Both the surface water and swale water values are bracketed by the range of values in groundwater and no meaningful conclusions are drawn.

Based on the apparent absence of anthropogenic sources and the limited geochemical data, the source of the water in Swale 4 appears to be groundwater. The potentiometric surface data support the close proximity of the water table to the ground surface in the vicinity of the head of Swale 4.

2.6 Ecology

2.6.1 Terrestrial Systems

NDWIH comprises approximately 2,000 acres of terrestrial ecological communities on Cornwallis Neck and about 1,000 acres on Stump Neck. Terrestrial habitats in these areas are classified as forested uplands, open uplands, and terrestrial cultural uplands. The forested areas on NDWIH are dominated by oaks (*Quercus* spp.), hickories (*Carya* spp.), tulip trees (*Liriodendron tulipifera*), and pine (*Pinus* spp.). Flowering dogwood (*Cornus florida*), redbud (*Cercis canadensis*), and American holly (*Ilex opaca*) are typical of the upland understory. The forests are heavily fragmented by buildings, roads, and other structures. Terrestrial cultural uplands consist of areas that have been created, maintained, or modified by human activities. These areas are characterized as either mowed grass/landscaped areas, wildlife food plots, or successional fields and roadsides.

2.6.2 Wetland Systems

National Wetland Inventory (NWI) maps identify approximately 290 acres of wetlands on NDWIH. Of this acreage, tidal estuarine systems total 234 acres, forested wetlands total 42 acres, emergent marshes and shrub swamps total 5.5 acres, and lacustrine systems make up the remaining acreage. There are also approximately 17 miles of riverine systems in this area.

At NDWIH, the tidal estuarine systems are associated with the Potomac River, Mattawoman Creek, and Chicamuxen Creek. Mattawoman Creek marshes are typically dominated by wild rice (*Zizania aquatica*), big cordgrass (*Spartina cynosuriodes*), cattail (*Typha* spp.), rose-mallow (*Hibiscus moscheutos*), tickseed sunflowers (*Bidens* spp.), pickerelweed (*Pontederia cordata*), and arrow arum (*Peltandra virginica*). Intertidal shoreline fringe marshes are

extremely rare and are dominated by water willow (*Justica americana*) or American threesquare (*Scirpus pungens*). The broad expansive marsh of Chicamuxen Creek contains an extremely diverse flora. An informal survey of this marsh conducted in 1988 identified more than 80 species of plants (Maryland Department of Natural Resources, 1992).

2.6.3 Fauna

The diverse ecological communities at NDWIH support many wildlife species. Faunal inventories were conducted by Maryland Natural Heritage Program as part of the 1991–1992 rare, threatened, and endangered species survey. NDWIH natural resources staff have conducted additional waterfowl and amphibian surveys. Currently, an estimated 15 species of damselflies, 26 of dragonflies, 48 of butterflies, 29 of mammals, 23 of reptiles, 20 of amphibians, and 119 of birds utilize the available habitat at NDWIH (Maryland Department of Natural Resources, 1992; Parsons Engineering Science, Inc., 2000).

2.6.4 Rare, Threatened, and Endangered Species

A survey of rare, threatened, and endangered species was conducted by the Maryland Natural Heritage Program in 1991 and1992. The survey focused on areas with a high potential for supporting rare, threatened, and endangered species. Of the listed species, the bald eagle (*Haliaeetus leucocephalus*) is the only known federally listed threatened species identified on NDWIH. The remainder of the species listed includes five state-listed endangered plants, two state-listed threatened plants, one state-listed endangered invertebrate, and 18 species of regional concern.

Three additional rare tree species were identified during the 1995 Urban Tree Inventory: the state-threatened eastern arborvitae (*Thuja occidentalis*), state-rare shingle oak (*Quercus imbricaria*), and potentially state-rare pussy willow (*Salix discolor*).

The 1991–1992 survey also identified 10 areas of ecological significance (totaling 614 acres) that have the potential to support the long-term protection of the rare, threatened, and endangered species. These protection areas are Bullitt Neck Point, Cornwallis Neck Marshes, Hog Island Cove, Thoroughfare Island, Chicamuxen Creek Marsh, Magnolia Seep, Porter Woods, Rum Point, Stump Neck Beaver Marsh, and West Stump Neck Shoreline.

2.7 References

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Table 2-1
Vertical Hydraulic Conductivity Test Results from Shelby Tubes
Site 28 RI Report, NDWIH, Indian Head, Maryland

Boring	Depth (feet bgs)	Vertical Hydraulic Conductivity (cm per sec)
IS28MW04	6-8	4.92×10^{-8}
IS28MW07	26-28	1.89×10^{-9}
Geometric mean		**2.55×10^{-8}**

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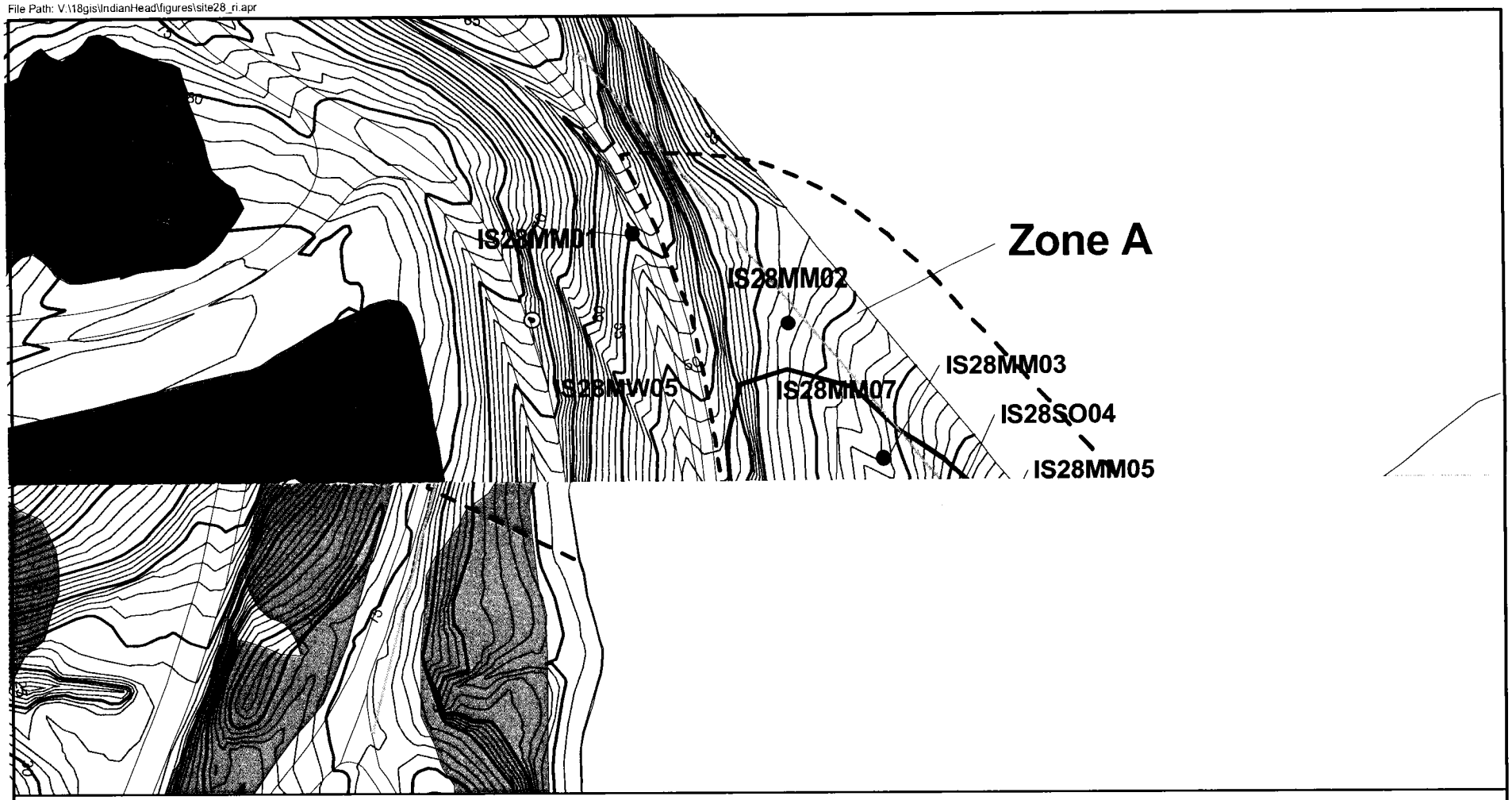

LEGEND

Sample locations are labeled with the Station ID, as described in Section 3.2.1

- Onshore Sample Location (GPS)
- Monitoring Well Location (Surveyed)
- Mattawoman Creek Sediment Sample Location (GPS)
- Zone Boundary
- Fence Line
- IR Site
- Five foot Contours
- One Foot Contours
- Buildings
- Railroads
- Roads

N

50 0 50 100 150 Feet

Figure 2-1
Site 28 Location of Geologic Cross Sections
Site 28 RI Report
NDWIH Indian Head, Maryland

CH2MHILL

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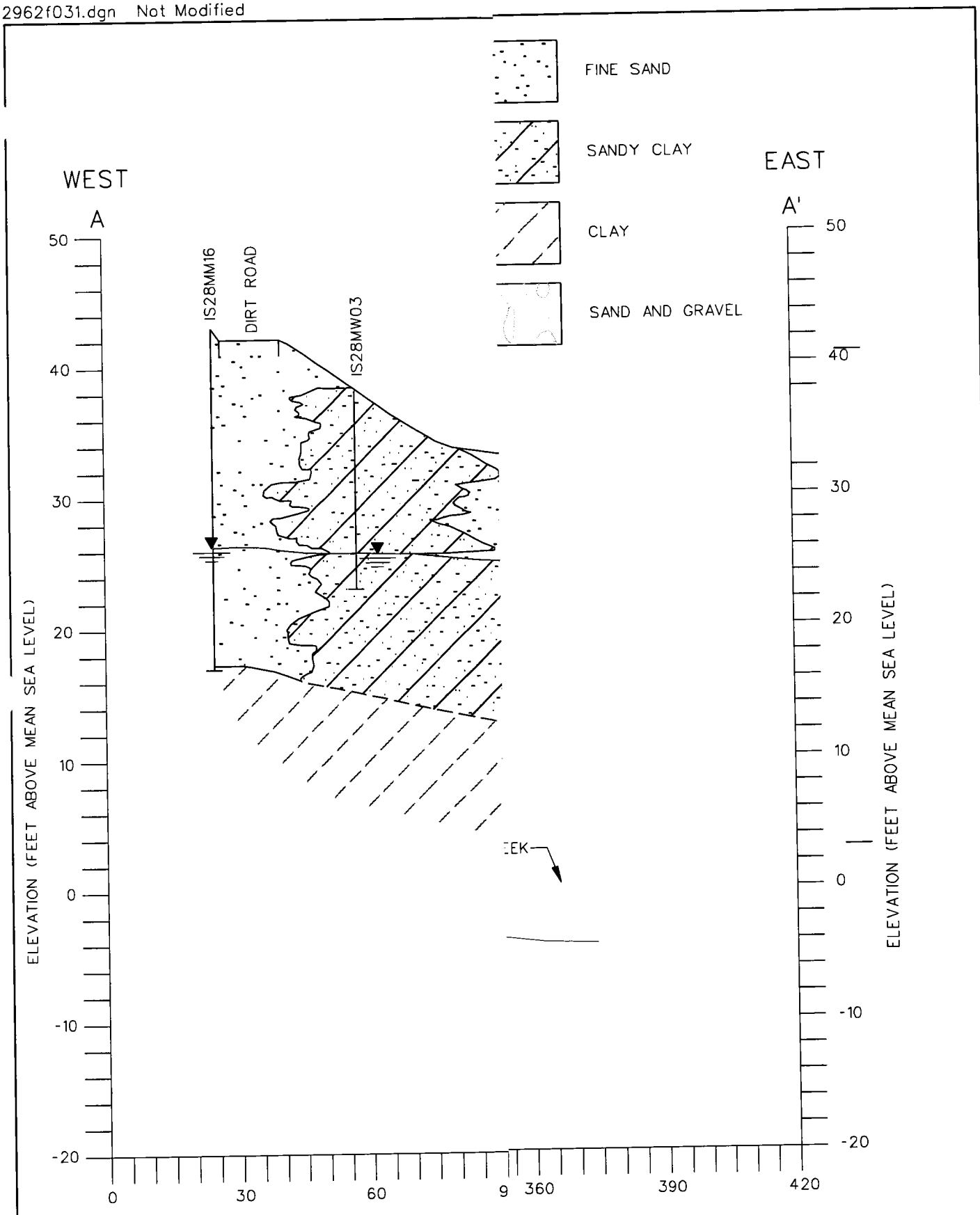

Figure 2-2
GEOLOGIC CROSS SECTION A-A'
SITE 28 RI REPORT
NDWIH, INDIAN HEAD, MARYLAND

CH2MHILL

2962f032.dgn Not Modified

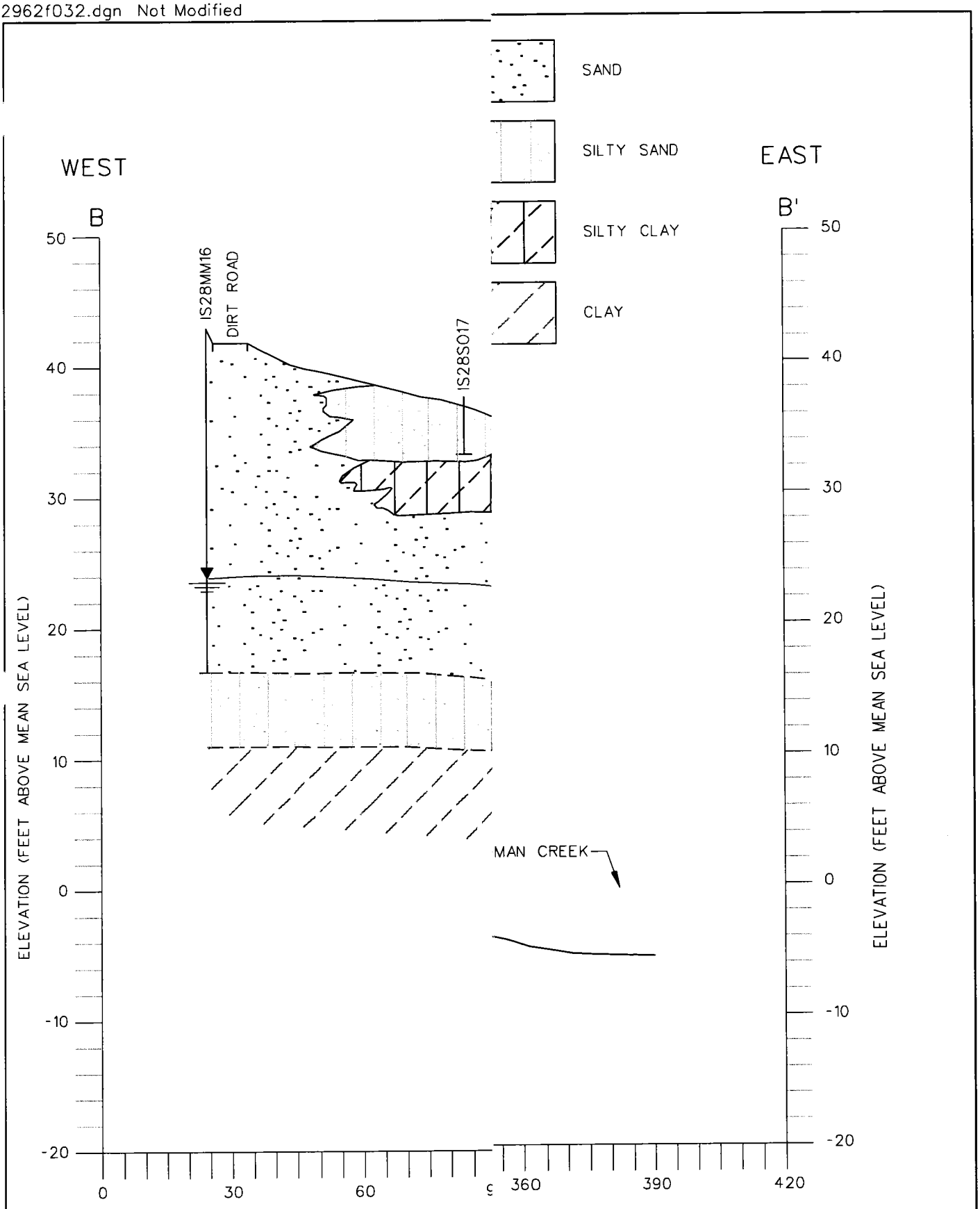

Figure 2-3
GEOLOGIC CROSS SECTION B-B'
SITE 28 RI REPORT
NDWIH, INDIAN HEAD, MARYLAND

CH2MHILL

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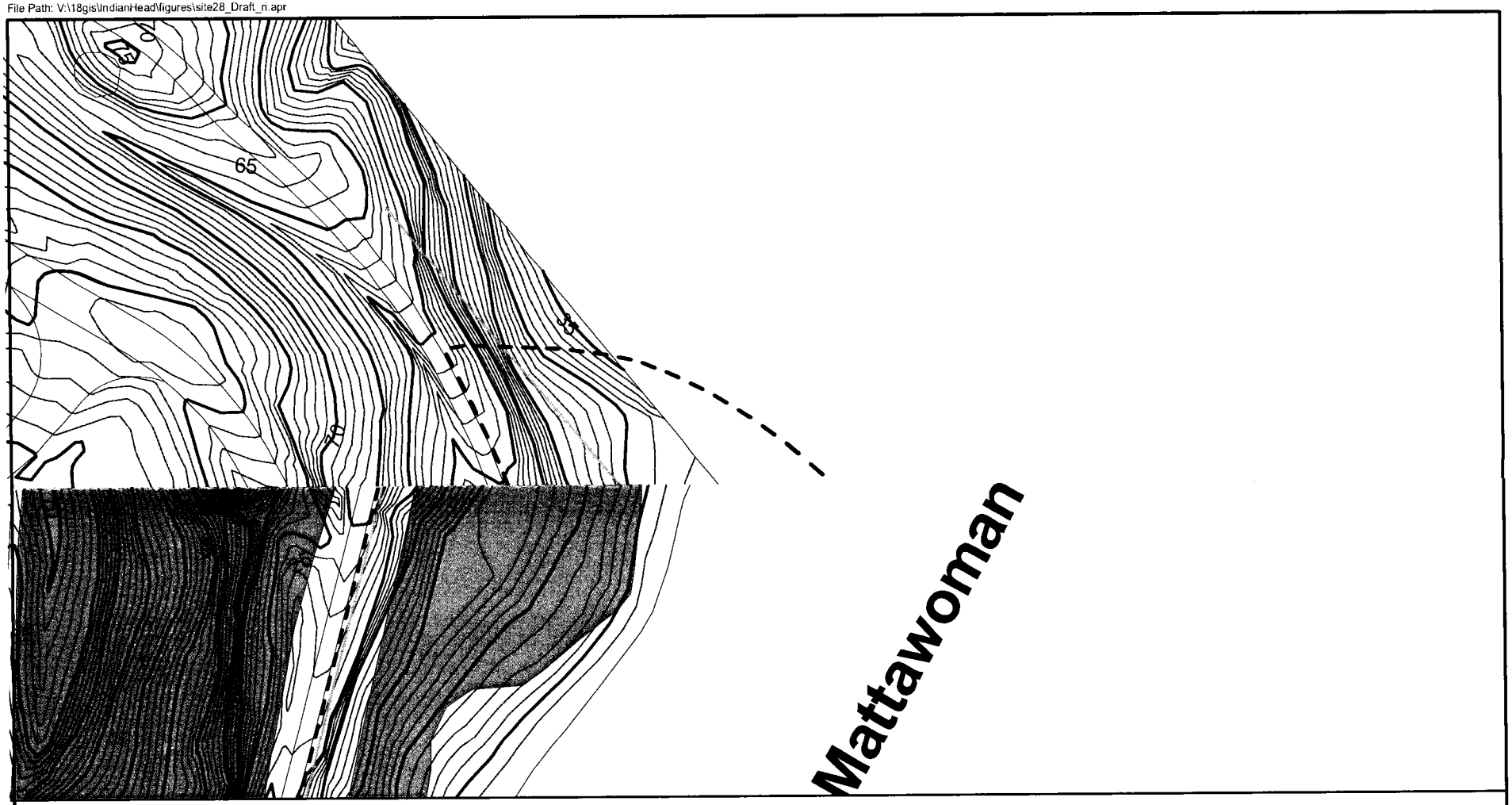

LEGEND

Sample locations are labeled with the Station ID, as described in Section 3.2.1

- Monitoring Well Location (Groundwater elevation feet above mean sea level)
- Zone Boundary
- Fence Line
- IR Site
- Five foot Contours
- One Foot Contours
- Roads

N

0 75 150 Feet

Figure 2-4
Monitoring Well Locations and
Water Levels September 10, 2003
Site 28 RI Report
NDWIH, Indian Head, Maryland

CH2MHILL

SECTION 3

Remedial Investigation Activities

This section describes the scope and rationale for the field activities that were conducted during the RI at Site 28 at NDWIH. A summary of the field activities conducted at the site is also provided.

3.1 Field Activities

An RI field investigation was conducted at Site 28 between May and August 2003. Figure 2-1 shows Zones A and B defined for the Site 28 investigation. This work consisted of sampling surface soil, subsurface soil, sediment, and groundwater. The objectives of this investigation were to (1) investigate the presence of contamination in soil, groundwater, surface water, and sediment, (2) to define the nature and extent of contamination; and (3) to evaluate the need for remediation based on the critical information developed in the human health and ecological risk assessments. The activities are described under sections specific to each type of environmental medium investigated.

Tables 3-1a through 3-1c list the various parameters tested for each sample and analytical test methods used during the field investigation. Actual detection limits for each sample and compound are shown in the analytical result summary tables presented in Section 4 and Appendix C. Figure 2-1 shows sample locations. Monitoring well sampling locations were professionally surveyed. All other sample locations were determined using a backpack-style GPS locator, which usually is accurate to several feet.

3.2 Sampling Nomenclature

3.2.1 Sample Station Identification System

Each sample station where one or more samples were taken is designated by an alphanumeric code that identifies the sampling location and contains a sequential sample number.

The following is a guide for the sample station identification system used:

First Segment of Station Number:	Second Segment of Station Number:	Third Segment of Station Number:	
Naval Installation Abbreviation	Site Number	Station Type	Station Location
A	ANN	AA	NN

Symbol Definition:

"A" = Alphabetic
"N" = Numeric

Site Naval installation Abbreviation:

I = One-letter abbreviation identifying the Naval Installation where the sample was collected (I = Indian Head)

Site Number:

S28 = One letter and two numbers identifying the site on the facility where the sample was collected (S28 = Site 28)

Station Type:

SO = Soil samples location
MM = Multiple matrices were collected from this location
SD = Sediment sample location
SW = Surface water location
SWSD = Surface water and sediment location
GW = Grab groundwater sample location
MW = Monitoring well location

Station Location:

NN = Primary samples – 2-digit number indicating sample location

3.2.2 Sample Identification System

Each sample is designated by an alphanumeric code that identifies the site and matrix sampled and contains a sequential sample number.

The following is a guide for the sample identification system used:

First Segment of Sample Number: Naval Installation Abbreviation	Second Segment of Sample Number: Site Number	Third Segment of Sample Number:		
		Sample Type	Sample Location	Additional Qualifiers (Sample Depth, Date)
A	ANN	AA	NN	NNNN

Symbol Definition:

"A" = Alphabetic
"N" = Numeric

Site Naval installation Abbreviation:

I = One- letter abbreviation identifying the Naval Installation where the sample was collected (I = Indian Head)

Site Number:

S28 = One letter and two numbers identifying the site on the facility where the sample was collected (S28 = Site 28)

Sample Type:

SS	=	Surface soil sample
SB	=	Subsurface soil sample
SD	=	Sediment sample
SW	=	Surface water sample
GW	=	Grab groundwater sample
MW	=	Monitoring well sample
WS	=	Waste (solid)
TB	=	Trip blank
EB	=	Equipment blank
FB	=	Field blank

Sample Location:

MM	=	QC samples—2-digit month of sampling event
NN	=	Primary samples—2-digit number indicating sample station

Additional Qualifiers:

MMYY =	Monitoring well, grab groundwater and surface water, and waste samples—2-digit month and 2-digit year of sampling event (e.g., May 2003 = 0503)
BDED =	Surface soil, subsurface soil, and grab groundwater sediment samples—2-digit beginning depth and 2-digit end depth rounded up to nearest foot (e.g., 2'3"-2'6" = 0203). Sediment samples—2-digit beginning depth and ending depth in inches (e.g., 0"-6" = 0006)
DDYY =	QC samples—2-digit day and 2-digit year of sampling event

Examples of this numbering approach are:

IS28SS040001	The surface soil sample collected at station ID number 4 from 0 ft to 1 ft at Site 28
IS28MGW020302	The 2nd second grab groundwater sample collected from IS28MW02 at Site 28 in March 2002
IS28WS010503	The 1st waste sample collected from drums at Site 28 in May 2003

Examples of this numbering approach for QA/QC samples are:

IS28FB051503	Field blank collected at Site 28 on May 15, 2003
IS28TB051503	Trip blank collected at Site 28 on May 15, 2003
IS28EB051503	Equipment blank collected at Site 28 on May 15, 2003

3.3 Zone A

3.3.1 Description

Zone A comprises the area between the north and south fence lines, the area outside of the fence line to the north, and shoreline to the east, as shown on Figure 1-3. The former zinc recovery furnace and the former burning cage are in Zone A (Figure 2-1). The former burning cage, used to burn scraps such as wooden crates, was just south of observation well number 14.

3.3.2 Direct-Push Surface and Subsurface Soil Sampling

Twenty-nine surface and subsurface soil samples (IS28SS01 through IS28SS24, IS28SS26 through IS28SS29, and IS28SS42) were collected throughout Zone A between May 12 and May 21, 2003, at the locations shown in Figure 2-1.

All surface-soil samples were collected from the top 6 in. of soil at each sample location using a stainless-steel trowel and bowl. Subsurface soil samples were sampled using a direct-push drill rig or a slide hammer with 2-ft split spoons. The 1- to 3-ft depth interval was sampled. Surface soil samples were analyzed for USEPA's Contract Laboratory Program Target Compound List (TCL) of volatile organic compounds (VOCs), for TCL semivolatile organic compounds (SVOCs), perchlorate, pH, total organic carbon (TOC), USEPA's Contract Laboratory Program Target Analyte List (TAL) of total metals, the SW-846 8330 list of nitroaromatics and nitroamines, nitroglycerine (NG), nitroguanidine (NQ), pentaerythritol tetranitrate (PETN), and grain size. Subsurface soil samples were analyzed for TCL VOCs, TCL SVOCs, perchlorate, total TAL metals, the SW-846 8330 list of nitroaromatics and nitroamines, NG, NQ, and PETN.

The following describes the specific locations for each of the soil samples.

(Note that the locations in Figure 2-1 have station-specific codes of "MM" or "SO" instead of "SS." "SO" indicates that only soil was sampled; "MM" indicates that direct-push groundwater was also sampled.)

Station ID	Description
IS28MM01	In a grassy area just west of a dirt road and just north of a drainage ditch. This location is upgradient of the site, and is a designated background sample
IS28MM02, IS28MM03, IS28SO04, and IS28MM05	In a grassy area approximately 0 to 50 ft south of the northern perimeter fence line
IS28MM06	Approximately 15 ft east of the dirt road
IS28MM07	In a grassy area approximately 75 ft south of the northern perimeter fence line and 75 ft east of the dirt road
IS28SO08 through IS28SO10	In a grassy area between the dirt road and the tree line in the center of Zone A
IS28SO11	Approximately 20 ft south of the northern perimeter fence line, just north of the confluence of Swales 1, 2, and 3
IS28SO12	Just north of the northern perimeter fence line

Station ID	Description
IS28SO13	In a grassy area approximately 55 ft east of the dirt road
IS28MM14	In a grassy area approximately 50 ft southeast of Well 14 and 40 ft northwest of the tree line in the center of Zone A
IS28SO15	At the northwest tree line in the center of Zone A
IS28MM16	Just west of the dirt road and just south of a drainage ditch. This location is upgradient of the site, and is a designated background sample
IS28SO17	Just south of Well 14
IS28SO18	Approximately 25 ft north of the tree line in the center of Zone A and just north of Swale 3
IS28SO19	At the southwest tree line in the center of Zone A
IS28MM20 and IS28SO21	In a grassy area approximately 50 to 75 ft northeast of the shoreline with Mattawoman Creek
IS28SO22, IS28MM23, and IS28SS24	At the tree line approximately 100 ft from the southern perimeter fence line
IS28SO26	Just south of Swale 4
IS28MM27, IS28MM28, and IS28SO29	In the woods at the southern side of Zone A
IS28MM42	A few feet from where Swale 4 daylights

3.3.3 Direct-Push Groundwater Sampling

Fourteen in situ groundwater samples were collected between May 12 and May 16, 2003, throughout Zone A, shown in Figure 2-1.

Samples were collected with a direct-push technology (DPT) rig fitted with a 4-ft stainless-steel sampling screen. The screen was not exposed until the desired depth was reached. Samples were brought to the surface using a peristaltic pump fitted with disposable polyethylene tubing. In situ groundwater samples were collected just below the water table. All in situ groundwater samples, except for IS28GW11, were analyzed for TCL VOCs, TCL SVOCs, perchlorate, field-filtered TAL metals, the SW-846 8330 list of nitroaromatics and nitroamines, NG, NQ, PETN, and dissolved organic carbon (DOC). Sample IS28GW11 had a slow recharge rate, and the field team were only able to collect sufficient volume for VOCs and field filtered metals.

The following describes the specific locations for each of the soil samples.

(The station IDs for these samples in Figure 2-1 contain "MM" instead of "GW." The MM abbreviation stands for mixed media, since soil was sampled along with groundwater at these locations.)

Station ID	Description
IS28MM01	In a grassy area just west of a dirt road and just north of a drainage ditch. This location is upgradient of the site, and is a designated background sample

Station ID	Description
IS28MM02, IS28MM03, and IS28MM05	In a grassy area approximately 10 to 50 ft south of the northern perimeter fence line
IS28MM06	Approximately 15 ft east of the dirt road
IS28MM07	In a grassy area approximately 75 ft south of the northern perimeter fence line and 75 ft east of the dirt road
IS28MM11	In a clear area approximately 35 ft southwest of the northeast perimeter fence line, on a steep slope, south of the confluence of Swales 2 and 3
IS28MM14	In a grassy area approximately 50 ft southeast of Well 14 and 40 ft northwest of the tree line in the center of Zone A
IS28MM16	Just west of the dirt road and just south of a drainage ditch. This location is upgradient of the site, and is a designated background sample
IS28MM20	In a grassy area approximately 80 ft off the shoreline of Mattawoman Creek
IS28MM23	Just west of Swale 4
IS28MM27 and IS28MM28	In a wooded area just north of the southern perimeter fence line
IS28MM42	Just north of Swale 4 and a culvert pipe

The proposed in situ sampling location for stations IS28MM11, IS28MM20, and IS28MM42 were approximately 75 ft from the shoreline with Mattawoman Creek. These locations were not accessible with the DPT rig due to steep terrain and a soft clay surface. The proposed in situ sampling location for stations IS28MM23, IS28MM27, and IS28MM28 were located at the south end of Zone A, which was also not accessible with the DPT rig due to steep terrain. The in situ groundwater samples taken from stations IS28MM11, IS28MM20, IS28MM23, IS28MM27, and IS28MM28 were collected using a slide hammer to reach the desired depth and a 1-in. schedule 80 polyvinyl chloride (PVC) screen placed in the borehole. The sample was collected using a peristaltic pump fitted with disposable polyethylene tubing. Station IS28MM42 is located approximately 50 ft west of its proposed location and sample IS28GW42 was collected using the DPT rig.

3.3.4 Sediment Sampling

Three sediment samples (IS28SD01 through IS28SD03) were collected on May 20 and 21, 2003. Two samples (IS28SD01 and IS28SD02) were collected from Swale 4, and one sample (IS28SD03) was collected from the confluence of Swales 1, 2, and 3. Samples were collected using disposable trowels. The station IDs are labeled IS28SWSD01 through IS28SWSD03, as shown in Figure 2-1.

All sediment samples were collected from the top 6 in. of soil at each of the sample locations and the samples were analyzed for TCL VOCs, TCL SVOCs, perchlorate, pH, TOC, total TAL metals, the SW-846 8330 list of nitroaromatics and nitroamines, NG, NQ, PETN, and grain size.

3.3.5 Surface Water Sampling

Three surface water samples (IS28SW01 through IS28SW03) were collected on May 20 and 21, 2003. Samples IS28SW01 and IS28SW02 were collected from Swale 4 and one surface water sample (IS28SW03) was collected from the confluence of Swales 1, 2, and 3. These samples are colocated with the three sediment samples in the previous section. The station IDs are labeled IS28SWSD01 through IS28SWSD03, as shown in Figure 2-1.

The samples were collected using a peristaltic pump and disposable silicone tubing. The samples were analyzed for TCL VOCs, TCL SVOCs, perchlorate, total TAL metals, dissolved TAL metals, the SW-846 8330 list of nitroaromatics and nitroamines, NG, NQ, PETN, and DOC.

3.3.6 Installation of Monitoring Wells

Five shallow groundwater-monitoring wells (IS28MW01 through IS28MW05) were installed from August 19 to August 21, 2003, at the locations shown on Figure 2-1. Wells IS28MW01 and IS28MW02 were placed in downgradient locations, approximately 50 ft from the Mattawoman Creek shoreline. Wells IS28MW03 and IS28MW04 were placed in upgradient locations. Background well IS28MW05 is located upgradient of the site. Proposed monitoring wells IS28MW06 and IS28MW07 were abandoned due to the absence of water.

The purpose of the wells is to monitor groundwater quality in the shallow water-bearing unit. All well boreholes were drilled to the water table and were installed with the screen straddling the water table.

The monitoring-well installations involved:

- Drilling with 4.25-in.-inner-diameter HSAs to the desired well depths
- Taking split-spoon samples every 2 ft with 2-in.-inner-diameter, 2-ft-long split spoons
- Characterizing the soil types and delineating the depth to the water table
- Constructing the well according to guidelines set out in the work plan; the wells were constructed with 2-in.-diameter PVC risers and screens
- Developing the wells by surging and pumping at least four well volumes of groundwater from each well

All new monitoring wells were developed until clarity and stability field parameters were obtained to remove fine-grained material that entered the well screens.

All material (primarily soil cuttings) generated during drilling of the well boreholes and all groundwater extracted during well development were placed in 55-gallon drums for characterization and proper disposal. The aqueous and solid investigation-derived waste (IDW) was determined to be nonhazardous and disposed of at an offsite facility.

All wells were surveyed for vertical and horizontal reference. Elevation points surveyed were the top of the PVC well riser, the top of protective casing, and the top of the concrete pad.

Lithologic logs and well-construction diagrams were prepared for the new wells. Lithologic logs are provided in Appendix A and well-construction diagrams are provided in Appendix

D, along with copies of the State of Maryland well completion reports. Well construction details are provided in Table 3-2.

3.3.7 Monitoring-Well Sampling

Groundwater monitoring-well samples were collected on September 9 and 10, 2003. Before sampling, each well was purged using Grundfos Redi2flow pumps and low-flow sampling techniques. During purging, groundwater from each monitoring well was monitored for pH, specific conductance, ORP, turbidity, DO, and temperature. Table 3-3 contains the values of the purge parameters. Wells IS28MW02, IS28MW03, and IS28MW05 had low recharge rates and the wells were purged using disposable bailers to remove three well volumes before sampling. Before groundwater sampling, a round of water-level measurements was collected from all five wells at Site 28 to provide data for a map of the water table in the shallow water-bearing unit.

Groundwater samples were analyzed for TCL VOCs, TCL SVOCs, the SW-846 8330 list of nitroaromatics and nitroamines, TAL metals (total and dissolved), NG, NQ, PETN, perchlorate, DOC, and hardness.

3.4 Zone B

3.4.1 Description

Zone B is reported as the "Original Burning Ground" in the IAS and as the "Shoreline Burning Cage" by Dolph (2001). This area, outside the NDWIH fence line but within Navy property, is south of Zone A (Figure 2-1). The area sampled extends approximately 600 ft south from the southern Zone A fence line. Most of the area inside the fence line is forested and sloped.

3.4.2 Surface Soil Sampling

Ten surface soil samples (IS28SS32 through IS28SS41) were collected throughout Zone B on May 19, 2003, at the locations shown in Figure 2-1.

Station ID	Description
IS28SO32 and IS28SO33	In a sloped forested area. IS28SS32 is about 50 ft from the dirt road and at about the middle of the north-south axis of Zone B. IS28SS33 is in the northeast corner of Zone B about 75 ft from the shore of Mattawoman Creek
IS28SO34	Just west of the dirt road, west of Zone B. This location is upgradient of the site, and is a designated background sample. It borders the northern half of Zone B
IS28SO35 through IS28SO37	In a sloped forested area, these three sites are all in the northern half of Zone B. IS28SS35 is roughly equidistant from the dirt road and Mattawoman Creek. IS28SS36 is about 50 ft from the shore of Mattawoman Creek. IS28SS37 is in the northwest corner of Zone B about 50 ft from the dirt road
IS28SO38	About 50 ft from Mattawoman Creek and at about the middle of north-south axis of Zone B

Station ID	Description
IS28SO39	Just west of the dirt road, west of Zone B. This location is upgradient of the site, and is a designated background sample. It borders the southern half of Zone B
IS28SO40 and IS28SO41	In a sloped forested area, both of these locations are near the southern fence line of Zone B. IS28SS40 is about 30 ft from the dirt road. IS28SS41 is about 50 ft from the shore of Mattawoman Creek

All surface-soil samples were collected from the top 6 in. of soil at each of the sample locations using a stainless-steel trowel and bowl. Surface soil samples were analyzed for TCL VOCs, TCL SVOCs, perchlorate, pH, TOC, total TAL metals, the SW-846 8330 list of nitroaromatics and nitroamines, NG, NQ, PETN, and grain size.

3.4.3 Subsurface Soil Sampling

Ten subsurface soil samples (IS28SB32 through IS28SB42) were collected throughout Site 28 Zone B on May 19, 2003 at the locations shown on Figure 2-1. The sample locations are the same as those described in the previous section.

Samples were collected using a slide hammer with 2-ft split spoons from depths of 1 to 3 ft below ground surface. Samples were analyzed for TCL VOCs, TCL SVOCs, perchlorate, total TAL metals, the SW-846 8330 list of nitroaromatics and nitroamines, NG, NQ, and PETN.

3.5 Ecological Risk Sediment Sampling

Twenty-nine sediment samples were collected from 15 locations in Mattawoman Creek adjacent to Site 28 (sampling locations IS28SD01 through IS28SD15 in Figure 2-1). Sediment samples were collected from two depth intervals (0–6 and 6–12 in.) by using a gravity sampler to collect sediment cores at each station. Only 29 samples were collected because refusal occurred at 6 in. below the sediment/water interface at location IS28SD08. The surface sediment samples (up to 6 in. depth) were collected to support the ERA. The subsurface sediment samples (6–12 in.) were collected to aid in determining the nature and extent and potential off-site migration of chemicals into Mattawoman Creek. Five sampling locations were located along the immediate Site 28 shoreline, five sampling locations were located in the channel, and five sampling locations were located in the littoral zone along the depositional bar across from Site 28. The channel samples could not be collected directly in the center of the channel because the substrate was too hard to obtain a sediment core from this area. Therefore, the channel samples were collected closer to the site than originally intended in some cases, and farther downstream than originally intended in one case (IS28SD06). The sampling locations were moved until a suitable substrate was encountered to ensure collection of a sediment core of at least 12 in. The sample locations shown on Figure 2-1 are actual locations as recorded with a differential GPS unit. All samples were analyzed for TAL metals. In addition, at three stations, one from each sampling zone (i.e., Site 28 shoreline, channel, and depositional bar), the surface and subsurface samples were analyzed for perchlorate, the SW-846 8330 list of nitroaromatics and nitroamines, NG, NQ, and PETN (Table 3-1c).

3.6 Ecological Inventory

An ecological inventory of the site was taken during the May sampling event. This is discussed in Section 7.3.4.

3.7 References

Dolph, J. 2001. Naval Historian. *Literature search summary for NDWIH Site 28.* September 11.

Table 3-1A
Sample Parameters - Zone A
Site 28 RI Report
NDWIH
Indian Head, Maryland

			Analysis											
Station ID	Sample ID Number	Media	TCL VOCs	TCL SVOCs	Perchlorate	pH, TOC	TAL Metals (total)	TAL Metals (Filtered)	Nitroaromatics/Nitroamines	Nitroguanidine	Nitroglycerine	PETN	Grain Size	DOC
Surface Soil Samples														
IS28MM01	IS28SS01-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28MM02	IS28SS02-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28MM03	IS28SS03-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28SO04	IS28SS04-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28MM05	IS28SS05-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28MM06	IS28SS06-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28MM07	IS28SS07-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28SO08	IS28SS08-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28SO09	IS28SS09-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28SO10	IS28SS10-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28MM11	IS28SS11-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28SO12	IS28SS12-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28SO13	IS28SS13-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28MM14	IS28SS14-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28SO15	IS28SS15-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28MM16	IS28SS16-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28SO17	IS28SS17-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28SO18	IS28SS18-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28SO19	IS28SS19-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28MM20	IS28SS20-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28SO21	IS28SS21-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28SO22	IS28SS22-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28MM23	IS28SS23-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28SO24	IS28SS24-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28SO26	IS28SS26-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28MM27	IS28SS27-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28MM28	IS28SS28-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28SO29	IS28SS29-0001	soil	X	X	X	X	X		X	X	X	X	X	
IS28MM42	IS28SS42-0001	soil	X	X	X	X	X		X	X	X	X	X	
Direct Push or Slide Hammer Subsurface Soil Samples														
IS28MM02	IS28SB02-0103	soil	X	X	X		X		X	X	X	X		
IS28MM03	IS28SB03-0103	soil	X	X	X		X		X	X	X	X		
IS28SO04	IS28SB04-0103	soil	X	X	X		X		X	X	X	X		
IS28MM05	IS28SB05-0103	soil	X	X	X		X		X	X	X	X		
IS28MM06	IS28SB06-0103	soil	X	X	X		X		X	X	X	X		
IS28MM07	IS28SB07-0103	soil	X	X	X		X		X	X	X	X		
IS28SO08	IS28SB08-0103	soil	X	X	X		X		X	X	X	X		
IS28SO09	IS28SB09-0103	soil	X	X	X		X		X	X	X	X		
IS28SO10	IS28SB10-0103	soil	X	X	X		X		X	X	X	X		
IS28MM11	IS28SB11-0103	soil	X	X	X		X		X	X	X	X		
IS28SO12	IS28SB12-0103	soil	X	X	X		X		X	X	X	X		
IS28SO13	IS28SB13-0103	soil	X	X	X		X		X	X	X	X		
IS28MM14	IS28SB14-0103	soil	X	X	X		X		X	X	X	X		
IS28SO15	IS28SB15-0103	soil	X	X	X		X		X	X	X	X		
IS28MM16	IS28SB16-0103	soil	X	X	X		X		X	X	X	X		
IS28SO17	IS28SB17-0103	soil	X	X	X		X		X	X	X	X		
IS28SO18	IS28SB18-0103	soil	X	X	X		X		X	X	X	X		
IS28SO19	IS28SB19-0103	soil	X	X	X		X		X	X	X	X		
IS28MM20	IS28SB20-0103	soil	X	X	X		X		X	X	X	X		
IS28SO21	IS28SB21-0103	soil	X	X	X		X		X	X	X	X		

Table 3-1A
Sample Parameters - Zone A
Site 28 RI Report
NDWIH
Indian Head, Maryland

			Analysis											
Station ID	Sample ID Number	Media	TCL VOCs	TCL SVOCs	Perchlorate	pH, TOC	TAL Metals (total)	TAL Metals (Filtered)	Nitroaromatics/Nitroamines	Nitroguanidine	Nitroglycerine	PETN	Grain Size	DOC
IS28SO22	IS28SB22-0103	soil	X	X	X		X		X	X	X	X		
IS28MM23	IS28SB23-0103	soil	X	X	X		X		X	X	X	X		
IS28SO24	IS28SB24-0103	soil	X	X	X		X		X	X	X	X		
IS28SO26	IS28SB26-0103	soil	X	X	X		X		X	X	X	X		
IS28MM27	IS28SB27-0103	soil	X	X	X		X		X	X	X	X		
IS28MM28	IS28SB28-0103	soil	X	X	X		X		X	X	X	X		
IS28SO29	IS28SB29-0103	soil	X	X	X		X		X	X	X	X		
IS28MM42	IS28SB42-0103	soil	X	X	X		X		X	X	X	X		
In Situ Groundwater Samples														
IS28MM01	IS28GW01-0503	water	X	X	X			X	X	X	X	X		X
IS28MM02	IS28GW02-0503	water	X	X	X			X	X	X	X	X		X
IS28MM03	IS28GW03-0503	water	X	X	X			X	X	X	X	X		X
IS28MM05	IS28GW05-0503	water	X	X	X			X	X	X	X	X		X
IS28MM06	IS28GW06-0503	water	X	X	X			X	X	X	X	X		X
IS28MM07	IS28GW07-0503	water	X	X	X			X	X	X	X	X		X
IS28MM11	IS28GW11-0503	water	X					X						
IS28MM14	IS28GW14-0503	water	X	X	X			X	X	X	X	X		X
IS28MM16	IS28GW16-0503	water	X	X	X			X	X	X	X	X		X
IS28MM20	IS28GW20-0503	water	X	X	X			X	X	X	X	X		X
IS28MM23	IS28GW23-0503	water	X	X	X			X	X	X	X	X		X
IS28MM25	IS28GW25-0503	water	X	X	X			X	X	X	X	X		X
IS28MM27	IS28GW27-0503	water	X	X	X			X	X	X	X	X		X
IS28MM28	IS28GW28-0503	water	X	X	X			X	X	X	X	X		X
IS28MM42	IS28GW42-0503	water	X	X	X			X	X	X	X	X		X
Surface Water Samples														
IS28SWSD01	IS28SW420503	water	X	X	X		X	X	X	X	X	X		X
IS28SWSD02	IS28SW430503	water	X	X	X		X	X	X	X	X	X		X
IS28SWSD03	IS28SW440503	water	X	X	X		X	X	X	X	X	X		X
Sediment Samples														
IS28SWSD01	IS28SD420503	sediment	X	X	X	X	X		X	X	X	X	X	
IS28SWSD02	IS28SD430503	sediment	X	X	X	X	X		X	X	X	X	X	
IS28SWSD03	IS28SD440503	sediment	X	X	X	X	X		X	X	X	X	X	

Table 3-1B
Sample Parameters - Zone B
Site 28 RI Report
NDWIH
Indian Head, Maryland

Station ID	Sample ID Number	Media	Analysis										
			TCL VOCs	TCL SVOCs	TAL Metals (total)	Nitroaromatics/Nitroamines	Nitroguanidine	Nitroglycerine	PETN	Perchlorate	pH	TOC	Grain Size
Surface Soil Samples													
IS28SO32	IS28SS32-0001	soil	X	X	X	X	X	X	X	X	X	X	X
IS28SO33	IS28SS33-0001	soil	X	X	X	X	X	X	X	X	X	X	X
IS28SO34	IS28SS34-0001	soil	X	X	X	X	X	X	X	X	X	X	X
IS28SO35	IS28SS35-0001	soil	X	X	X	X	X	X	X	X	X	X	X
IS28SO36	IS28SS36-0001	soil	X	X	X	X	X	X	X	X	X	X	X
IS28SO37	IS28SS37-0001	soil	X	X	X	X	X	X	X	X	X	X	X
IS28SO38	IS28SS38-0001	soil	X	X	X	X	X	X	X	X	X	X	X
IS28SO39	IS28SS39-0001	soil	X	X	X	X	X	X	X	X	X	X	X
IS28SO40	IS28SS40-0001	soil	X	X	X	X	X	X	X	X	X	X	X
IS28SO41	IS28SS41-0001	soil	X	X	X	X	X	X	X	X	X	X	X
Subsuface Soil Samples													
IS28SO32	IS28SB32-0103	soil	X	X	X	X	X	X	X	X			
IS28SO33	IS28SB33-0103	soil	X	X	X	X	X	X	X	X			
IS28SO34	IS28SB34-0103	soil	X	X	X	X	X	X	X	X			
IS28SO35	IS28SB35-0103	soil	X	X	X	X	X	X	X	X			
IS28SO36	IS28SB36-0103	soil	X	X	X	X	X	X	X	X			
IS28SO37	IS28SB37-0103	soil	X	X	X	X	X	X	X	X			
IS28SO38	IS28SB38-0103	soil	X	X	X	X	X	X	X	X			
IS28SO39	IS28SB39-0103	soil	X	X	X	X	X	X	X	X			
IS28SO40	IS28SB40-0103	soil	X	X	X	X	X	X	X	X			
IS28SO41	IS28SB41-0103	soil	X	X	X	X	X	X	X	X			

Notes:
Station IDs with a SO indicate that only soil samples were taken at this location
The last 4 digits indicate the depth of the sample. 0001 means 0-6 inches, 0103 means 1 to 3 feet.

Table 3-1C
Sample Parameters - Mattawoman Creek
Site 28 RI Report
NDWIH
Indian Head, Maryland

Station ID	Sample ID Number	Media	Analysis								
			TCL SVOCs	TAL Metals (total)	Nitroaromatics/Nitroamines	Nitroguanidine	Nitroglycerine	PETN	Perchlorate	pH	TOC
Mattawoman Creek Sediment Samples											
IS28SD01	IS28SD010006	Sediment		X							
	IS28SD010612	Sediment		X							
IS28SD02	IS28SD020006	Sediment	X	X	X	X	X	X	X	X	X
	IS28SD020612	Sediment	X	X	X	X	X	X	X	X	X
IS28SD03	IS28SD030006	Sediment		X							
	IS28SD030612	Sediment		X							
IS28SD04	IS28SD040006	Sediment		X							
	IS28SD040612	Sediment		X							
IS28SD05	IS28SD050006	Sediment		X							
	IS28SD050612	Sediment		X							
IS28SD06	IS28SD060006	Sediment		X							
	IS28SD060612	Sediment		X							
IS28SD07	IS28SD070006	Sediment		X							
	IS28SD070612	Sediment		X							
IS28SD08	IS28SD080006	Sediment		X							
IS28SD09	IS28SD090006	Sediment	X	X	X	X	X	X	X	X	X
	IS28SD090612	Sediment	X	X	X	X	X	X	X	X	X
IS28SD10	IS28SD100006	Sediment		X							
	IS28SD100612	Sediment		X							
IS28SD11	IS28SD110006	Sediment	X	X	X	X	X	X	X	X	X
	IS28SD110612	Sediment	X	X	X	X	X	X	X	X	X
IS28SD12	IS28SD120006	Sediment		X							
	IS28SD120612	Sediment		X							
IS28SD13	IS28SD130006	Sediment		X							
	IS28SD130612	Sediment		X							
IS28SD14	IS28SD140006	Sediment		X							
	IS28SD140612	Sediment		X							
IS28SD15	IS28SD150006	Sediment		X							
	IS28SD150612	Sediment		X							

Notes:
Station IDs with a SD indicate that only sediment samples were taken at this location.
The last 4 digits indicate the depth of the sample in inches.

TABLE 3-2
Monitoring Well Construction Details—Site 28 RI Report
Site 28 RI Report, NDWIH, Indian Head, Maryland

Well Designation	Elevation at Top of Casing (ft msl)	Elevation at Ground Surface (ft msl)	Bottom of Screen		Top of Screen	
			Depth (ft bgs)	Elevation (ft msl)	Depth (ft bgs)	Elevation (ft msl)
IS28MW01	7.17	4.30	6	-1.7	1	3.30
IS28MW02	12.10	9.30	4	5.30	1	8.30
IS28MW03	42.53	39.90	14	25.90	4	35.90
IS28MW04	38.70	35.80	14	21.80	4	31.80
IS28MW05	74.06	74.10	35	39.10	25	49.10

ft msl = feet above mean sea level.

ft bgs = feet below ground surface.

TABLE 3-3
Stabilized Parameters from Groundwater Sampling—Site 28 RI Report
Site 28 RI Report, NDWIH, Indian Head, Maryland

Well	pH	ORP (millivolts)	Conductivity (MicroSiemens/cm)	Turbidity (NTU)	Dissolved Oxygen (mg/l)	Temperature (°C)
September 2003 Sampling Event						
IS28MW01	7.23	-10	0.208	16.6	2.43	26.80
IS28MW02*	7.30	1	0.263	53.1	6.67	24.31
IS28MW03*	5.13	201	0.235	872	10.91	21.65
IS28MW04	3.34	295	0.109	49.9	8.63	22.40

* Due to slow recharge rates the monitoring well had to purged using a bailer to remove 3 times the well volume and field parameters could not be taken. Values shown above are the last parameters taken before the bailer was used.

Notes:

No field parameters were taken for monitoring well IS28MW05 due to low water yield.

Abbreviations:

ORP = oxidation-reduction potential (measured in millivolts, mV)

µS/cm = microsiemens per centimeter

NTU = Nephelometric turbidity units

mg/L = milligrams per liter

SECTION 4

Nature and Extent of Contamination

4.1 Introduction

Section 4 summarizes the analytical data collected during the RI activities at Site 28 and assesses the nature and extent of contamination at the site. Nature and extent are discussed by media: surface soil, subsurface soil, sediment, surface water, in situ groundwater, and groundwater from monitoring wells. The constituents detected in samples collected during the RI activities are summarized in tables and presented in figures located at the end of this section. Tables in Appendix C present all constituents analyzed for all samples, whether detected or not.

The discussion presented below focuses on the contaminants that are most prevalent at Site 28. Some contaminants from each contaminant group (VOCs, SVOCs, metals, etc.) are discussed. Regulatory and human health-based criteria were not used to select contaminants; however, preference was given to contaminants that are generally recognized to pose the greatest risks to human health and the environment.

The focus on this "short list" of contaminants is not meant to serve as a formal screening out of other contaminants, but simply a way to focus the discussion. The baseline HHRA and ERA presented in Sections 6 and 7, respectively, formally screen and evaluate all chemicals analyzed for in the various media at Site 28 in accordance with established USEPA Region III guidance.

In order to identify metals that may be of potential concern at Site 28, the data for inorganic analytes were compared to data presented in the *Background Soil Investigation Report* (BSIR) prepared by Tetra Tech NUS (2002). The BSIR was conducted to establish a facility-wide background database to be used for current and future investigations. Samples were collected for the various media from areas outside the sites known to have been affected by facility operations. The facility-wide background statistics for each medium are presented in Appendix E.

Sampling results for inorganic analytes in various media at Site 28 were compared to background concentrations as follows:

- Maximum detected concentrations for data collected during the investigation were compared to the upper confidence limits (UCLs) of the facility-wide background data as shown in Appendix F.
- Sampling means were compared to the background means.

Where an inorganic analyte exceeds background and is discussed for one medium (e.g., surface soil), the analyte may be discussed for another medium (e.g., subsurface soil) even if the concentrations in the second medium do not exceed background. This is to allow a more

complete view of the nature and extent of contamination, as well as to aid in the analysis of contaminant fate and transport.

It should be noted that the facility-wide groundwater background data set is based on unfiltered metals concentrations. The direct push groundwater data are all field filtered, but the analytical data generated from in situ sampling are generally considered to be more turbid than if the sample had been sampled from a monitoring well. The monitoring well data contains both total and filtered metals data.

The following should also be noted: (1) when generating descriptive statistics for the RI data sets, if a compound in a particular sample was not detected, a concentration equal to half the laboratory detection limit was used for risk assessment; (2) if a compound was detected in a sample and a corresponding duplicate also was collected, the higher of the two values was used; and (3) data points rejected by the data validator were excluded from the descriptive statistics.

Background surface water and sediment samples were not collected as part of the background investigation and, therefore, are unavailable for comparison.

4.2 Data Quality Assessment

The data quality was evaluated to assess the usability of the analytical results. The analytical data quality is dependent on laboratory performance, matrix interference, ambient laboratory and field conditions, and field sampling technique. Data quality is used to assess whether the project's data quality objectives were met. The data quality assessment comprised reviewing the results of the laboratory QC review, the data validation reports, and the data validation qualifiers applied to the data.

4.2.1 Laboratory Quality Control Review

Prior to the release of the analytical results, the laboratory reviewed the sample and QC data to verify sample identity, instrument calibration, detection limits, dilution factors, numerical computations, accuracy of transcriptions, and chemical interpretations. Additionally, the QC data were reduced and the results were reviewed to ascertain whether they were within the laboratory-defined limits for accuracy and precision. Nonconforming results were identified and were discussed in the data package cover letter and associated case narrative.

4.2.2 Data Validation

The Site 28 RI data, excluding direct push groundwater samples, were reviewed by an independent data validator following USEPA (1993, 1994) Region III guidelines for data validation of organic and inorganic results. Areas of review included holding time compliance, surrogate recovery accuracy, matrix spike sample precision and accuracy, blank contamination, initial and continuing calibration accuracy and precision, laboratory control sample accuracy, internal standard response and retention time accuracy, instrument tune criteria accuracy, and laboratory and field sample duplicate precision.

4.2.3 Data Quality Evaluation

CH2M HILL conducted the data quality evaluation, which consisted of reviewing the analytical data for systematic errors. An evaluation of the data quality is made based on the number of, severity of, and distribution of these data qualifiers. The data qualifiers were tallied, and data validation reports were reviewed on an as needed basis if clarification was needed for any of the qualified data.

The data evaluation showed that the majority of the analytical results were unqualified and acceptable as reported. The vast majority of the "J" qualifiers are present because the analyte concentration is between the method detection limit and the instrument reporting limit. These "J" qualified results are acceptable for use as reported.

The "J," "K," "L," "UJ," and "UL" qualifiers indicate that the data values are estimated. These qualifiers can indicate the presence of a quality control problem and are considered usable by risk assessors when determining risk to human health and the environment.

The data evaluation showed that the sample results qualified with a "B," indicating blank contamination, are usable at their adjusted reporting limits. Analytes such as acetone and methylene chloride are common laboratory contaminants, and the qualified results should not, alone, be used to make project decisions. Only 4.5 percent of the data were "B" qualified.

The "R" qualifier indicates that a sample has been rejected. It is not uncommon that some of the data will be rejected during a large environmental sampling and analysis effort. The results that are rejected should not be used to make project decisions. Approximately 0.6 percent of the data were "R" qualified.

With the exception of the "R" qualified results (and with caution regarding the "B" qualified results), the remedial investigation data and the SI data for Site 28 are of sufficient quality to support risk and site assessment. A more detailed review of the Site 28 data quality is contained in Appendix C. The data quality objectives for this project were to collect data of adequate quality to perform human health and ecological risk assessments, and to define the nature and extent of contamination of the site. In this case data quality did not hinder any of these objectives, so the data quality objectives for the project were met.

4.3 Surface Soil

Surface soil sampling activities conducted at Site 28 consisted of collecting 39 samples, including four duplicate samples (IS28SS02-0001 through IS28SS15-0001, IS28SS17-0001 through IS28SS24-0001, IS28SS26-0001 through IS28SS29-0001, IS28SS32-0001, IS28SS33-0001, IS28SS35-0001 through IS28SS38-0001, and IS28SS40-0001 through IS28SS42-0001). The results of surface soil sampling are presented in Table 4-1. Selected results of the VOCs, SVOCs, and metals are presented in Figures 4-1 and 4-2. Note that the four sample locations west of the road (locations IS28SS01, IS28SS16, IS28SS34, and IS28SS39) are site background surface soil samples that are upgradient of Site 28. The site background surface soil sample results are shown in Table 4-2.

4.3.1 VOCs and SVOCs

VOCs were detected in 22 of the 39 surface soil samples (including one duplicate sample) collected with concentrations ranging between 0.4 µg/kg and 11 µg/kg. IS28SS21-0001P and IS28SS41-0001 had five VOC detections.

Of the 39 surface soil samples, 31 had detected concentrations of SVOCs ranging from 20 µg/kg to 12,000 µg/kg. With few exceptions these same analytes were also detected in at least one of the background surface soil samples. The polycyclic aromatic hydrocarbons (PAHs) benzo(a)pyrene and dibenz(a,h)anthracene contributed to the risk for a future resident child's potential soil ingestion. These PAHs would not have caused the hazard index to be above 1 on their own; the arsenic risk overshadowed the risk contributed by these PAHs by almost a factor of one hundred. PAH contamination at the site was generally found to be highest at the center of the former zinc recovery furnace area extending down to about the fence line between Zones A and B. Lower detects of PAHs were also present sporadically throughout Zone B. Figure 4-1 shows the extent of the most commonly detected VOCs and SVOCs.

The concentrations in most of the RI samples for VOCs and SVOCs were generally lower than or close to the reporting limit, and are not the primary risk drivers for the site. Thus, they are not discussed further.

4.3.2 Explosives

The explosive analyses include the full nitroaromatics and nitroamines list published in USEPA's SW-846 method 8330, NG, NQ, and perchlorate. These compounds were detected in 12 of the 39 surface soil samples at Site 28. Detections ranged from 57 µg/kg to 670 µg/kg. IS28SS42-0001, IS28SS15-0001, and IS28SS24-0001 had the highest frequency of explosive detections. All three contained detectable concentrations for 2,4,6-trinitrotoluene, 2,4-dinitrotoluene, and nitrobenzene. Of these, IS28SS24-0001 had the highest concentrations of all three chemicals at 450, 230, and 620 µg/kg, respectively. Nitrobenzene was detected at a concentration of 37 µg/kg in background sample IS28SS16-0001. Most of the explosive detects were in the center of the former zinc recovery furnace area, extending south to the fenceline between Zone A and Zone B. Only two sample locations (IS28SO32 and IS28SO37), which are inland of a burning cage located south of the zinc recovery furnace, contained any detectable levels of explosives in Zone B.

4.3.3 Metals

All 39 surface soil samples have detected concentrations of metals. The range of concentrations is from 0.21 milligrams per kilogram (mg/kg) to 71,900 mg/kg. This discussion focuses on the metals that were identified as risk drivers for surface soils in Sections 6 and 7: antimony, arsenic, cadmium, copper, lead, mercury, nickel, silver, and zinc.

Antimony was only detected in six samples, at concentrations ranging from 0.67 to 18.3 mg/kg. The second highest sample concentration was 3.9 mg/kg, so the highest concentration is much higher than all of the other antimony concentrations. These sample detects were almost all on the eastern downgradient half of the former zinc recovery furnace area.

Arsenic was detected in all sample locations with concentrations ranging from 2.8 mg/kg in IS28SS37-0001 to 303 mg/kg in IS28SS28-0001. All samples except IS28SS37-0001 exceed the background 95 percent UCL.

Cadmium was detected in 28 of the 39 surface soil samples, ranging in concentration from 0.32 to 141 mg/kg. All of the largest sample concentrations are at the eastern central area of the former zinc recovery furnace. The sample concentrations decrease just outside this area. Sample concentrations of 10 mg/kg or less tend to be spread around the site. Most of the sample locations in Zone B did not contain detectable concentrations of cadmium.

Copper was detected in all of the 39 surface soil samples, ranging in concentration from 5.3 to 1,270 mg/kg. According to the basewide background soil concentration study performed by Tetra Tech NUS (Appendix E), the 95 percent UCL for copper at the site is 8.0 mg/kg. Almost all of the surface soil samples at Site 28 contain copper at concentrations higher than this 95 percent UCL. All of these sample locations are on the periphery or shoreline of Site 28 in Zone A. Copper was detected in the upgradient samples at concentrations as high as 50 mg/kg. There are nine sample detections that are above 50 mg/kg. The six samples with the highest detected levels of copper are adjacent to each other in the central eastern area of the former zinc recovery furnace. The other three samples with detected levels above 50 mg/kg are in the vicinity.

Lead was detected in all surface soil samples with concentrations ranging from 10.7 mg/kg in IS28SS12-0001 to 16,800 mg/kg in IS28SS41-0001. Of the 39 surface soil samples, 34 exceed the background 95 percent UCL for lead.

Mercury was detected in 17 of the 39 surface soil samples, ranging in concentration from 0.12 to 11.5 mg/kg. The second-highest level detected was 1.1 mg/kg, so the highest sample concentration is much higher than the other mercury concentrations. Most of the detected concentrations are 0.31 mg/kg and lower. Five sample locations and one upgradient background sample (IS28M16) contain concentrations of mercury ranging from 0.84 to 11.5 mg/kg. These six sample locations are in the center of the former zinc recovery furnace area, going from east to west across the area. Concentrations are higher on the eastern end of this east-west band of contamination. Most of the sample locations that did not contain a mercury detection are in Zone B, on the northern or southern border of Zone A, or along the shoreline of Zone A.

Nickel was detected in 30 of the 39 surface soil samples, ranging in concentration from 2.8 to 44.1 mg/kg. The basewide background 95 percent UCL for nickel at NDWIH is estimated to be 6.6 mg/kg (Appendix E). The sample locations with the highest concentrations of nickel follow a very similar pattern to mercury. The locations with the highest detected concentrations are the same. The sample locations with the highest nickel concentrations are in the center of the former zinc recovery furnace area, going from east to west across the area. Concentrations are higher on the eastern end of this east-west band of contamination.

Zinc was found at all sample locations at concentrations ranging from 44.4 mg/kg to 71,900 mg/kg. All surface soil samples exceed the background 95 percent UCL for zinc.

All detected metals in surface soil samples were also detected in at least one background surface soil sample. Because of the widespread detections, there does not appear to be

spatial trend in the data for lead or arsenic. Zinc concentrations are greatest in Zone A, especially around the former location of the zinc recovery furnace (see Figure 4-2).

4.4 Subsurface Soil

Subsurface soil sampling activities conducted within Site 28 consisted of collecting 38 samples (IS28SS02-0001 through IS28SS15-0001, IS28SS17-0001 through IS28SS24-0001, IS28SS26-0001 through IS28SS29-0001, IS28SS32-0001, IS28SS33-0001, IS28SS35-0001 through IS28SS38-0001, and IS28SS40-0001 through IS28SS42-0001) including three duplicate samples. The results of subsurface soil sampling are presented in Table 4-3 and selected results are presented in Figures 4-3 and 4-4. Note that the four sample locations west of the road (IS28SS01, IS28SS16, IS28SS34, and IS28SS39) are site background surface soil samples that are upgradient of Site 28. The site background surface soil sample results are shown in Table 4-4.

4.4.1 VOCs and SVOCs

VOCs were detected in 20 of the 38 subsurface soil samples with concentrations ranging from 0.5 µg/kg to 31 µg/kg. IS28SB32-0103 had the highest number of detected compounds, but the range of concentrations is only 2 µg/kg to 6 µg/kg. Acetone, detected only in two samples, was detected at 31 µg/kg in IS28SB08-0103. Methyl-tert-butyl ether (MTBE) was the only VOC that was detected at the site with any regularity. VOCs are not the site's primary risk drivers for human health or ecological risk assessment and are not discussed further in this section.

SVOCs were detected in 22 of the subsurface soil samples. Detected concentrations range from 15 µg/kg to 2,000 µg/kg. With the exception of the one detection of n-nitrosodiphenylamine at 2,000 µg/kg in sample IS28SB19-0105, none of the SVOCs detected exceeded 1,000 µg/kg, and few were over 500 µg/kg. The greatest number of SVOCs was detected at sample locations IS28SO10, IS28SO17, IS28SO18, IS28MM23, and IS28MM42 - all in the location of the former zinc recovery furnace. SVOCs are not the site's primary risk drivers for human health or ecological risk assessment.

4.4.2 Explosives

The explosives analytical suite included the full nitroaromatics and nitroamines list published in USEPA's SW-846 method 8330, NG, NQ, and perchlorate. Of the 38 subsurface soil samples, explosives were detected in 17 at values ranging from 41 µg/kg to 390 µg/kg. Nitrobenzene and 2,4,6-trinitrotoluene were both detected in background subsurface soil sample IS28SB01-0103. Most of the explosives were detected in Zone A. No explosive compounds were selected as contaminants of potential concern during the human health or ecological risk assessment.

4.4.3 Metals

Multiple metals were detected in all 38 subsurface soil samples collected. Lead and zinc were detected in all samples and arsenic was detected in 36 of the 38 samples. Detected concentrations range from 0.13 mg/kg to 130,000 mg/kg. With very few exceptions these metals were also detected in the background subsurface soil samples.

This discussion focuses on arsenic, lead, and zinc since they are the primary human health risk drivers for this site. Subsurface soils are generally not considered for screening ecological risk assessments, which is why fewer metals are discussed here compared to the surface soil metals (Section 4.3.3).

Arsenic was detected in 36 of the 38 subsurface soil samples. Sample IS28SB23-0103 contained the highest detected level of 324 mg/kg, and samples IS28SB03-0103 and IS28SB05-0103 had the next highest detected levels of 81 and 85 mg/kg. All of the other arsenic sample concentrations were below 40 mg/kg, and the average sample concentration was 30 mg/kg. The highest subsurface sample concentration was actually seen in the background upgradient sample IS28SB34-0103. Most of the high arsenic detects were in the former zinc recovery furnace area. The only exception to this is the Zone B upgradient background samples that are close to the road. This may be caused by spraying of pesticide along the road when it used to be a railroad line.

Lead was detected in every subsurface soil samples from 3.4 mg/kg to 16,600 mg/kg in sample IS28SB19-0105. Three samples have detects over 1,000 mg/kg (IS28SB10-0103 at 1,640 mg/kg, IS28SB14-0103 at 1,090 mg/kg, and IS28SB23-0103 at 1,020 mg/kg). The four highest detects are all right next to each other at the center of the former zinc recovery furnace area. All of the other detects were below 500 mg/kg. The average detect value was 523 mg/kg, 131 mg/kg if the highest detection is not included.

Zinc was detected in every subsurface soil samples from 7.3 mg/kg to 51,100 mg/kg. Three samples have detects over 10,000 mg/kg (IS28SB19-0103 at 51,100 mg/kg, IS28SB10-0103 at 33,900 mg/kg, and IS28SB14-0103 at 24,100 mg/kg). These three highest detects are adjacent to one another at the center of the former zinc recovery furnace area. All of the other high detects above 1,000 mg/kg are also in the former zinc recovery furnace area, or just downgradient of it.

4.5 Sediment

Sediment sampling activities conducted within Site 28 consisted of collecting four samples from swales (IS28SD01-0503 through IS28SD03-0503), including one duplicate sample, and also collecting 31 sediment samples, including two duplicate samples, from Mattawoman Creek (IS28SD010612 through IS28SD150612). The results of sediment sampling are presented in Table 4-5 and selected metal results are presented in Figure 4-5.

4.5.1 VOCs and SVOCs

VOCs were detected in all four swale sediment samples ranging from 1 µg/kg to 3 µg/kg. The Mattawoman Creek samples were not analyzed for VOCs. Because of the low detected concentrations, VOCs are not discussed further in this section.

SVOCs were detected in three of the four swale sediment samples and ranged from 26 µg/kg to 820 µg/kg. The sample collected from the groundwater that daylights into Swale 4 and the sample from the confluence of Swales 1, 2, and 3 contain several low-level concentrations of 1,2-dichloroethene, acetone, MTBE, and cis-1,2-dichloroethene. The sample taken at the end of Swale 4 before it empties into Mattawoman Creek contains a few SVOCs just above the laboratory's detection limit threshold.

Six Mattawoman Creek sediment samples were analyzed for SVOCs. These make up three pairs of samples taken 0–6 and 6–12 in. deep. Five of the six samples contained SVOC concentrations ranging from 28 to 160 µg/kg. Few SVOCs were detected at two of the locations (IS28SD02 and IS28SD09). Several SVOCs were detected above laboratory detection limits at one location, IS28SD11. This sample was collected at the sediment location farthest (about 200 ft) from the shore of Site 28 where SVOCs were analyzed.

4.5.2 Explosives

Explosives include the full nitroaromatics and nitroamines list published in USEPA's SW-846 method 8330, NG, NQ, and perchlorate. Explosives were detected only in one swale sample (IS28SD02-0503) taken from the groundwater daylighting into Swale 4. The concentrations range from 59 µg/kg for 2-amino-4,6-dinitrotoluene to 25,000 µg/kg for NG. None of the three Mattawoman Creek samples location contained any samples with explosive detects.

4.5.3 Metals

Metals were detected in all four swale sediment samples with concentrations ranging from 0.38 mg/kg for mercury in IS28SD02-0503P to 31,900 mg/kg for iron in IS28SD02-0503. Zinc was detected at high levels in all four samples at concentrations of 1,420 mg/kg to 14,200 mg/kg. Sediment results are tabulated in Table 4-5.

Metals were detected in all 31 Mattawoman Creek sediment samples. Concentrations range from 0.13 mg/kg for beryllium in IS28SD010612 to 39,600 mg/kg for iron in IS28SD060612. Elevated level of arsenic (up to 36 mg/kg), lead (up to 716 mg/kg), and zinc (up to 10,700 mg/kg) were seen at the sediment samples taken on the shore of Mattawoman Creek downgradient of the former zinc recovery furnace. Concentrations of most metals were significantly lower offshore, but did not show any obvious patterns. The primary risk drivers for ecological risk are mostly located in the swales and along the immediate shoreline of Site 28. These metals include arsenic, cadmium, copper, lead, and zinc. The northern part of the shoreline within Zone A and the swales contain the most metals contamination. Further offshore from the site, the ecological risk drivers for sediment are silver and mercury. Concentrations of the most commonly detected metals are diagrammed on the map shown in Figure 4-5. Sediment results are summarized in Table 4-5.

4.6 Groundwater

Groundwater sampling activities conducted within Site 28 consisted of collecting 14 in situ groundwater samples (IS28GW02-0503, IS28GW03-0503, IS28GW05-0503 through IS28GW07-0503, IS28GW11-0503, IS28GW14-0503, IS28GW20-0503, IS28GW23-0503, IS28GW27-0503, IS28GW28-0503, and IS28GW42-0503) plus two duplicates and sampling four monitoring wells (IS28MW010903 through -040903) with one duplicate.

The results of the in situ groundwater sampling are presented in Table 4-6. The results of monitoring well sampling are presented in Table 4-7 and selected results are presented in Figures 4-6 and 4-7. Note that the two sample locations west of the road (IS28GW01 and IS28GW16) are site background in situ groundwater samples that are upgradient of Site 28. Background upgradient in situ and monitoring well results are shown in Table 4-8. One

background monitoring well was installed (IS28MW05) as a background monitoring well, and sample results from this well are included in Table 4-7.

4.6.1 VOCs and SVOCs

Three VOCs (acetone, carbon tetrachloride, and methylene chloride) were detected in the in situ groundwater samples. These VOCs were detected in 10 of the 14 in situ samples with concentrations ranging from 1 µg/L to 5 µg/L. Acetone and carbon tetrachloride were detected in the upgradient groundwater samples at similar levels.

One VOC (toluene) was detected in one of the monitoring well samples at 2 µg/L. One detection for carbon tetrachloride was reported at 1 µg/L, but this was in the background sample upgradient of Site 28. These detections are both very close to the laboratory's threshold of detection.

The VOC concentrations were too low to warrant any need to investigate the source, so they will not be discussed further in this section.

Two SVOCs (di-n-butylphthalate and bis(2-ethylhexyl)phthalate) were detected in the in situ samples. Six of the 13 samples analyzed for SVOCs contain detected results for one of these compounds. No samples contain both. The concentrations ranging from 1 µg/L to 41 µg/L. Bis(2-ethylhexyl)phthalate was also detected in a background monitoring well sample, but neither of the direct push upgradient samples. Two of the detections for di-n-butylphthalate (1 and 2 µg/L respectively) were located at the central northern end of the site (locations MM05 and MM07). None of the other detections showed any pattern.

Two SVOCs (4-methylphenol and caprolactam) were detected in the monitoring well samples. Of the four samples analyzed for SVOCs, two had detections. The detected concentrations for caprolactam range from 3 µg/L to 9 µg/L. The background upgradient well to Site 28 contained a detection of caprolactam at 90 µg/L, so it is unlikely that the source of caprolactam is Site 28. There was only one detection for 4-methylphenol, and it was detected at 0.6 µg/L. It was detected at IS28MW02 on the eastern edge of the former zinc recovery furnace area.

4.6.2 Explosives

Explosives include the full nitroaromatics and nitroamines list published in USEPA's SW-846 method 8330, NG, NQ, and perchlorate. Nitrobenzene was detected in one of the fourteen in situ samples at 0.23 µg/L.

No explosives were detected in any of the monitoring well samples.

4.6.3 Metals

This discussion focuses on the monitoring well samples. Although filtered metals were collected at several of the in situ groundwater sampling locations, their purpose was primarily as a screening tool. The detections of metals in groundwater, based on direct push samples, did follow a spatial pattern. Almost all of the highest metal detections (especially arsenic, lead, and zinc) were on the downgradient side of the former zinc recovery furnace area. One exception was sample IS28GW23-0503; it also contained elevated levels of arsenic

levels and zinc, but was taken on the southern end of the former zinc recovery furnace area, close to the forest line. This is detailed in Table 4-6 and Figure 4-6.

The four monitoring well samples had widespread metal detections in both total and dissolved metals. The detected concentrations of total metals range from 0.4 µg/L for beryllium in IS28MW020903 to 125,000 µg/L for iron in IS28MW050903. Of note, lead was detected in all four monitoring well samples at concentrations of 4.8 µg/L to 29.9 µg/L. Lead was detected in the background upgradient monitoring well at 17.4 µg/L. Zinc was also detected in all four samples at concentrations of 100 µg/L to 1620 µg/L. Zinc was detected in the background upgradient monitoring well at 153 µg/L. Arsenic was detected in three of the four samples at concentrations ranging from 12.1 µg/L to 347 µg/L. Arsenic was detected in the background upgradient monitoring well at 28 µg/L.

The detected concentrations of dissolved metals range from 0.33 µg/L for beryllium in both IS28MW020903 and IS28MW040903 to 65300 µg/L for iron in IS28MW050903. Of note, lead was detected in three of the four monitoring well samples at concentrations of 2.2 µg/L to 12.5 µg/L. Lead was detected in the background upgradient monitoring well at 9.1 µg/L. Zinc was also detected in all four samples at concentrations of 75.1 µg/L to 1,230 µg/L. Zinc was detected in the background upgradient monitoring well at 82.8 µg/L. Arsenic was detected in three of the four samples at concentrations ranging from 4.2 µg/L to 317 µg/L. Arsenic was detected in the background upgradient monitoring well at 13.7 µg/L. this is detailed in Figure 4-7 and Table 4-7.

For both total and dissolved metals the following trends are present. Arsenic concentrations are highest directly downgradient of the former zinc recovery furnace area. Lead concentrations are highest downgradient and to the north of the former zinc recovery furnace area, and right by the dirt road. Zinc concentrations are highest downgradient of the former zinc recovery furnace area, and right by the dirt road. Aluminum, cadmium, iron, manganese, and vanadium contributed to the risk for future residents' drinking water. For these metals the highest sample concentrations were generally seen in the background upgradient well (IS28MW05). No obvious spatial pattern emerged at the site, which is expected because there are only four locations.

Groundwater is not used to determine ecological risk because ecological receptors are not exposed directly to groundwater. However, groundwater is a potential source of metals to the nearshore sediments and surface water, and thus will be considered in the management of ecological risk for these media and will be further evaluated in the Site 28 BERA.

4.7 Surface Water

Surface water sampling activities conducted within Site 28 consisted of collecting four samples (IS28SW01-0503 through IS28SD03-0503) including one duplicate sample. The results of surface water sampling are presented in Table 4-9 and selected results are presented in Figure 4-8.

4.7.1 VOCs and SVOCs

Surface water samples were analyzed for VOCs and SVOCs, but none were detected in any samples.

4.7.2 Explosives

Explosives include the full nitroaromatics and nitroamines list published in USEPA's SW-846 method 8330, NG, NQ, and perchlorate. Nitrobenzene was detected at 0.15 µg/L in IS28SW02-0503. No other explosives were detected in any surface water samples.

4.7.3 Metals

All four surface water samples had detected concentrations of both total and dissolved metals. The range of concentrations in total metals is 0.63 µg/L for cobalt in IS28SW01-0503 to 21,700 µg/L in IS28SW01-0503 for sodium. The range of concentrations for dissolved metals is 0.83 µg/L for cobalt in IS28SW01-0503 to 21,100 µg/L also in IS28SW01-0503 for sodium.

The surface water contained only one detection of arsenic at 3.8 µg/L for total metals, and no arsenic detections for dissolved metals. Lead was not detected at all in the surface water. Zinc concentrations did not vary significantly between the total and dissolved results. The total zinc concentrations ranged from 2,830 to 4,140 µg/L. Cadmium concentrations did not vary much at each location or between the filtered and total results. Cadmium ranged from 4.7 to 7.4 µg/L. The total metals results for all of the metals that were detected are shown in Figure 4-8.

Concentrations of certain metals are lower in the surface water samples than from the swales. This may be due to geochemical changes associated with oxidation on contact with dissolved oxygen or to dilution from other water sources such as leaking water lines. For example, the iron concentration in groundwater at IS28GW42-0503 (filtered) is 7,490 µg/L; the swale surface water concentration near this location is 6,600 µg/L. At the end of the swale, near its discharge, the iron concentration decreases to 63.6 µg/L. Concomitant with this is the presence of iron staining in the sediments of the swale. The concentration change, together with the iron staining, might indicate that the dissolved iron is oxidizing and precipitating out of solution. Other influences on surface water geochemistry include the availability of other anions more readily available in surface water than in groundwater that could, upon complexation, cause certain metals to precipitate out and others to go into solution.

It is interesting to note that iron concentrations are much higher in sample IS28SW02-0503 at 6,600 µg/L than any of the other surface water samples.

4.8 References

Tetra Tech NUS. 2002. *Background Soil Investigation Report for Indian Head and Stump Neck Annex, Naval Surface Warfare Center, Indian Head, Maryland.* October.

USEPA. Region III. 1994. *Region III Modifications to National Functional Guidelines for Organic Data Review, Multi Media, Multi Concentration,* September 1994.

USEPA. Region III. 1993. *Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses,* April 1993.

Glossary of Data Qualifier Codes

U	Not detected. The associated number indicates approximate sample concentration necessary to be detected
(NO CODE)	Confirmed Identification
B	Not detected substantially above the level reported in laboratory or field blanks
R	Unreliable result. Analyte may or may not be present in the sample. Supporting data necessary to confirm result
N	Tentative identification. Consider present. Special methods may be needed to confirm its presence or absence in future sampling efforts.
J	Analyte present. Reported value may not be accurate or precise.
K	Analyte present. Reported value may be biased high. Actual value is expected lower.
L	Analyte present. Reported value may be biased low. Actual value is expected to be higher.
UJ	Not detected, quantitation limit may be inaccurate or imprecise.
UL	Not detected, quantitation limit is probably higher.
Q	No analytical result
NJ	Qualitative identification questionable due to poor resolution. Presumptively present at approximate quantity.

The footers of the following tables contain an abbreviated definition of the most commonly-used data qualifiers.

Source: Region III Modifications to National Functional Guidelines for Organic Data Review, September 1994

Table 4-1
Detected Compounds in Surface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28MM02	IS28MM03	IS28MM05	IS28MM06	IS28MM07	IS28MM11		IS28MM14
Sample ID	IS28SS02-0001	IS28SS03-0001	IS28SS05-0001	IS28SS06-0001	IS28SS07-0001	IS28SS11-0001	IS28SS11-0001P	IS28SS14-0001
Sample Date	05/12/03	05/12/03	05/12/03	05/15/03	05/16/03	05/13/03	05/13/03	05/15/03
Chemical Name								
Volatile Organic Compounds (UG/KG)								
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	NA	NA
Cumene	12 U	13 U	11 U	12 U	13 U	11 U	13 U	11 U
Methyl acetate	12 U	13 U	11 U	12 U	13 U	11 U	13 U	11 U
Methyl-tert-butyl ether (MTBE)	0.4 J	0.9 J	0.5 J	12 U	13 U	11 U	13 U	11 U
Styrene	12 U	13 U	11 U	12 U	13 U	11 U	13 U	11 U
Xylene, total	12 U	13 U	11 U	12 U	13 U	11 U	13 U	11 U
cis-1,2-Dichloroethene	12 U	13 U	11 U	12 U	13 U	11 U	13 U	11 U
m- and p-Xylene	NA	NA	NA	NA	NA	NA	NA	NA
Semi-volatile Organic Compounds (UG/KG)								
1,1-Biphenyl	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
2,4,5-Trichlorophenol	990 U	1,100 U	940 U	970 U	1,100 U	1,100 U	1,000 U	940 U
2,4,6-Trichlorophenol	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
2,4-Dichlorophenol	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
2,4-Dimethylphenol	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
2,4-Dinitrotoluene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
2,6-Dinitrotoluene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
2-Chloronaphthalene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
2-Chlorophenol	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
2-Methylnaphthalene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
2-Methylphenol	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
2-Nitroaniline	990 U	1,100 U	940 U	970 U	1,100 U	1,100 U	1,000 U	940 U
2-Nitrophenol	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
4,6-Dinitro-2-methylphenol	990 U	1,100 U	940 U	970 U	1,100 U	1,100 U	1,000 U	940 U
4-Bromophenyl-phenylether	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
4-Chloro-3-methylphenol	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
4-Chlorophenyl-phenylether	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
4-Methylphenol	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Acenaphthene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Acenaphthylene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Acetophenone	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Anthracene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Atrazine	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U

B - Not detected above blank
J - Estimated
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L - Biased low
JB - Estimated, not detected above blank

R - Unreliable
U - Not detected
UJ - Not detected, Estimated
UL - Not detected, biased low

Table 4-1
Detected Compounds in Surface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28MM02	IS28MM03	IS28MM05	IS28MM06	IS28MM07	IS28MM11		IS28MM14
Sample ID	IS28SS02-0001	IS28SS03-0001	IS28SS05-0001	IS28SS06-0001	IS28SS07-0001	IS28SS11-0001	IS28SS11-0001P	IS28SS14-0001
Sample Date	05/12/03	05/12/03	05/12/03	05/15/03	05/16/03	05/13/03	05/13/03	05/15/03
Chemical Name								
Benzaldehyde	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Benzo(a)anthracene	390 U	21 J	370 U	29 J	450 U	430 U	410 U	370 U
Benzo(a)pyrene	390 U	440 U	370 U	32 J	450 U	430 U	410 U	370 U
Benzo(b)fluoranthene	390 U	440 U	370 U	61 J	450 U	430 U	410 U	370 U
Benzo(g,h,i)perylene	390 U	440 U	370 U	28 J	450 U	430 U	410 U	370 U
Benzo(k)fluoranthene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Bis(2-chloro-1-methylethyl) ether	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Butylbenzylphthalate	390 U	440 U	370 U	340 J	450 U	430 U	410 U	50 J
Caprolactam	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Carbazole	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Chrysene	390 U	23 J	370 U	50 J	450 U	430 U	410 U	370 U
Di-n-butylphthalate	60 B	45 B	370 U	410 B	450 U	430 U	410 U	640 B
Di-n-octylphthalate	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Dibenz(a,h)anthracene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Dibenzofuran	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Diethylphthalate	390 U	440 U	370 U	36 J	450 U	430 U	410 U	44 J
Dimethyl phthalate	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Fluoranthene	390 U	34 J	370 U	54 J	450 U	430 U	410 U	370 U
Fluorene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Hexachlorobenzene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Hexachlorobutadiene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Hexachlorocyclopentadiene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Hexachloroethane	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Indeno(1,2,3-cd)pyrene	390 U	440 U	370 U	30 J	450 U	430 U	410 U	370 U
Isophorone	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Naphthalene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Nitrobenzene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Pentachlorophenol	990 U	1,100 U	940 U	970 U	1,100 U	1,100 U	1,000 U	940 U
Phenanthrene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Phenol	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Pyrene	390 U	31 J	370 U	55 J	450 U	430 U	410 U	370 U
bis(2-Chloroethoxy)methane	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
bis(2-Chloroethyl)ether	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
bis(2-Ethylhexyl)phthalate	390 U	440 U	370 U	120 J	450 U	430 U	410 U	370 U
n-Nitroso-di-n-propylamine	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U

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Table 4-1
Detected Compounds in Surface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28MM02	IS28MM03	IS28MM05	IS28MM06	IS28MM07	IS28MM11		IS28MM14
Sample ID	IS28SS02-0001	IS28SS03-0001	IS28SS05-0001	IS28SS06-0001	IS28SS07-0001	IS28SS11-0001	IS28SS11-0001P	IS28SS14-0001
Sample Date	05/12/03	05/12/03	05/12/03	05/15/03	05/16/03	05/13/03	05/13/03	05/15/03
Chemical Name								
n-Nitrosodiphenylamine	390 U	440 U	370 U	750	450 U	430 U	410 U	370 U
Explosives (UG/KG)								
1,3,5-Trinitrobenzene	100 U	100 U	100 U	100 UL	100 U	100 U	670	100 U
2,4,6-Trinitrotoluene	100 UL	100 UL	100 UL	100 UL	100 UL	100 UL	100 UL	100 UL
2,4-Dinitrotoluene	100 U	100 U	100 U	100 UL	100 U	100 U	100 U	100 U
HMX	200 U	200 U	200 U	200 UL	200 UL	200 U	200 U	200 UL
Nitrobenzene	100 UL	100 UL	100 UL	120 L	100 UL	57 J	100 U	100 UL
Tetryl	200 U	200 U	200 U	200 UL	200 U	200 U	200 U	200 U
Total Metals (MG/KG)								
Aluminum	7,830	8,420	4,270	7,510	10,200	3,000	3,770	4,640
Antimony	0.56 B	0.37 B	0.26 R	0.25 U	0.24 U	0.27 R	0.27 R	0.25 U
Arsenic	117	40.4	44.5	137	26.2	85.3 L	73.4 L	5.9
Barium	45.5	92.5	27.7 J	63.5	58.8	31.8 J	37.3 J	28.3 J
Beryllium	0.42 B	0.39 B	0.14 B	0.35 B	0.4 B	0.21 B	0.29 B	0.13 B
Cadmium	1 K	1.3 K	23.9	17.2	0.95 K	25.9	19.7	6.3
Calcium	174 J	8,330	195 J	753 J	3,200	576 J	977 J	1,180
Chromium	8.3 K	31.9	6.1	12.5	21.4	9.8	7.2	8.4
Cobalt	5.8 J	4.4 J	1.6 J	4.3 J	3.4 J	2.4 J	2.2 J	2.2 J
Copper	5.3 K	28	35.4	98.4	15.6	64.6	53	33.4
Iron	8,470	15,700	4,350	15,700	15,800	8,350	11,100	6,840
Lead	31.2	41.4	288	430	22.8	731	836	189
Magnesium	547 J	883 J	258 J	648 J	927	224 J	279 J	318 J
Manganese	370	378	42.2	151	122	63.1	50.3	57.3
Mercury	0.08 B	0.06 B	0.02 B	0.31	0.21	0.08 B	0.06 B	0.07 B
Nickel	7.7 K	8 J	2.33 U	9.4 B	10.4 B	4 J	4.4 J	5.8 B
Potassium	410 J	282 J	235 J	623 B	336 B	188 J	267 J	225 B
Selenium	0.46 B	0.73 B	0.83 B	0.39 U	0.38 U	0.43 U	0.46 J	0.4 U
Silver	0.7 B	4.7 B	0.95 U	0.9 U	1.6 B	0.98 U	1 J	0.91 U
Sodium	17.8 B	32.3 B	21.4 B	28.3 B	40.4 B	31.6 B	38.9 B	20.9 B
Vanadium	15.4	32.7	12.4 K	20	31.3	18.2 K	26.2	13.7 K
Zinc	193	506	11,800	8,650	281	17,200	23,700	5,060
Wet Chemistry (MG/KG)								

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Table 4-1
Detected Compounds in Surface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28MM02	IS28MM03	IS28MM05	IS28MM06	IS28MM07	IS28MM11		IS28MM14
Sample ID	IS28SS02-0001	IS28SS03-0001	IS28SS05-0001	IS28SS06-0001	IS28SS07-0001	IS28SS11-0001	IS28SS11-0001P	IS28SS14-0001
Sample Date	05/12/03	05/12/03	05/12/03	05/15/03	05/16/03	05/13/03	05/13/03	05/15/03
Chemical Name								
% Solids	75	76	88	85	68	83	81	90
Total organic carbon (TOC)	9,600	34,000	2,800	13,000	17,000	15,000	13,000	16,000
pH	6.7	7.8	10	7.5	6.9	7.2	7	7.4

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Table 4-1
Detected Compounds in Surface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28MM20	IS28MM23	IS28MM28	IS28MM42	IS28SO04		IS28SO08	IS28SO09
Sample ID	IS28SS20-0001	IS28SS23-0001	IS28SS28-0001	IS28SS42-0001	IS28SS04-0001	IS28SS04-0001P	IS28SS08-0001	IS28SS09-0001
Sample Date	05/20/03	05/15/03	05/20/03	05/14/03	05/20/03	05/20/03	05/13/03	05/12/03
Chemical Name								
Volatile Organic Compounds (UG/KG)								
1,2-Dichloroethene (total)	10 U	NA	2 L	NA	13 UJ	12 U	NA	NA
Cumene	10 U	14 U	20 UL	12 U	13 UJ	12 U	14 U	11 U
Methyl acetate	10 U	14 U	20 UL	12 U	13 UJ	12 U	14 U	11 U
Methyl-tert-butyl ether (MTBE)	10 U	14 U	3 L	12 U	3 J	12 U	1 J	11 U
Styrene	10 U	14 U	20 UL	12 U	13 UJ	12 U	14 U	11 U
Xylene, total	10 U	14 U	20 UL	12 U	13 UJ	12 U	14 U	11 U
cis-1,2-Dichloroethene	10 U	14 U	2 L	12 U	13 UJ	12 U	14 U	11 U
m- and p-Xylene	10 U	NA	20 UL	NA	13 UJ	12 U	NA	NA
Semi-volatile Organic Compounds (UG/KG)								
1,1-Biphenyl	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
2,4,5-Trichlorophenol	960 U	1,100 U	1,700 U	5,200 U	1,100 U	1,100 U	1,000 U	940 U
2,4,6-Trichlorophenol	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
2,4-Dichlorophenol	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
2,4-Dimethylphenol	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
2,4-Dinitrotoluene	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
2,6-Dinitrotoluene	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
2-Chloronaphthalene	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
2-Chlorophenol	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
2-Methylnaphthalene	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
2-Methylphenol	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
2-Nitroaniline	960 U	1,100 U	1,700 U	5,200 U	1,100 U	1,100 U	1,000 U	940 U
2-Nitrophenol	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
4,6-Dinitro-2-methylphenol	960 U	1,100 U	1,700 U	5,200 U	1,100 U	1,100 U	1,000 U	940 U
4-Bromophenyl-phenylether	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
4-Chloro-3-methylphenol	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
4-Chlorophenyl-phenylether	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
4-Methylphenol	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Acenaphthene	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Acenaphthylene	380 U	22 J	690 U	2,100 U	430 U	430 U	400 U	370 U
Acetophenone	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Anthracene	380 U	35 J	690 U	2,100 U	430 U	430 U	400 U	370 U
Atrazine	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U

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Table 4-1
Detected Compounds in Surface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28MM20	IS28MM23	IS28MM28	IS28MM42	IS28SO04		IS28SO08	IS28SO09
Sample ID	IS28SS20-0001	IS28SS23-0001	IS28SS28-0001	IS28SS42-0001	IS28SS04-0001	IS28SS04-0001P	IS28SS08-0001	IS28SS09-0001
Sample Date	05/20/03	05/15/03	05/20/03	05/14/03	05/20/03	05/20/03	05/13/03	05/12/03
Chemical Name								
Benzaldehyde	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Benzo(a)anthracene	380 U	200 J	37 J	130 J	430 U	430 U	43 J	23 J
Benzo(a)pyrene	380 U	220 J	36 J	160 J	430 U	430 U	45 J	370 U
Benzo(b)fluoranthene	380 U	330 J	60 J	180 J	30 J	430 U	98 J	39 J
Benzo(g,h,i)perylene	380 U	140 J	690 U	540 J	430 U	430 U	400 U	370 U
Benzo(k)fluoranthene	380 U	130 J	690 U	97 J	430 U	430 U	41 J	19 J
Bis(2-chloro-1-methylethyl) ether	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Butylbenzylphthalate	110 J	430 U	690 U	2,100 U	430 U	430 U	45 J	370 U
Caprolactam	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Carbazole	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Chrysene	380 U	260 J	43 J	130 J	25 J	430 U	58 J	30 J
Di-n-butylphthalate	550	36 B	37 J	2,100 U	430 U	430 U	98 B	370 U
Di-n-octylphthalate	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Dibenz(a,h)anthracene	380 U	57 J	690 U	500 J	430 U	430 U	400 U	370 U
Dibenzofuran	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Diethylphthalate	37 J	23 J	690 U	2,100 U	430 U	430 U	400 U	370 U
Dimethyl phthalate	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Fluoranthene	380 U	380 J	81 J	150 J	38 J	430 U	75 J	26 J
Fluorene	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Hexachlorobenzene	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Hexachlorobutadiene	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Hexachlorocyclopentadiene	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Hexachloroethane	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Indeno(1,2,3-cd)pyrene	380 U	220 J	690 U	530 J	430 U	430 U	44 J	370 U
Isophorone	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Naphthalene	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Nitrobenzene	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Pentachlorophenol	960 U	1,100 U	1,700 U	5,200 U	1,100 U	1,100 U	1,000 U	940 U
Phenanthrene	380 U	140 J	38 J	68 J	430 U	430 U	400 U	370 U
Phenol	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Pyrene	380 U	410 J	71 J	190 J	33 J	430 U	58 J	28 J
bis(2-Chloroethoxy)methane	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
bis(2-Chloroethyl)ether	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
bis(2-Ethylhexyl)phthalate	78 B	430 U	190 B	220 J	110 B	99 B	100 B	370 U
n-Nitroso-di-n-propylamine	380 UL	430 U	690 UL	2,100 U	430 UL	430 UL	400 U	370 U

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U - Not detected
UJ - Not detected, Estimated
UL - Not detected, biased low

Table 4-1
Detected Compounds in Surface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28MM20	IS28MM23	IS28MM28	IS28MM42	IS28SO04		IS28SO08	IS28SO09
Sample ID	IS28SS20-0001	IS28SS23-0001	IS28SS28-0001	IS28SS42-0001	IS28SS04-0001	IS28SS04-0001P	IS28SS08-0001	IS28SS09-0001
Sample Date	05/20/03	05/15/03	05/20/03	05/14/03	05/20/03	05/20/03	05/13/03	05/12/03
Chemical Name								
n-Nitrosodiphenylamine	380 U	430 U	690 U	320 J	430 U	430 U	180 J	370 U
Explosives (UG/KG)								
1,3,5-Trinitrobenzene	100 U	100 U	100 U	100 UL	100 U	100 U	100 U	100 U
2,4,6-Trinitrotoluene	100 U	100 UL	100 U	340 L	100 U	100 U	100 UL	100 UL
2,4-Dinitrotoluene	100 U	100 U	100 U	130 L	100 U	100 U	100 U	100 U
HMX	200 U	200 UL	200 U	200 UL	200 U	200 U	200 U	200 U
Nitrobenzene	97 J	100 UL	100 U	190 L	100 U	100 U	100 U	100 UL
Tetryl	200 U	200 U	200 U	200 UL	200 U	200 U	200 U	200 U
Total Metals (MG/KG)								
Aluminum	2,300 J	5,190	6,900 J	6,760	4,690 J	5,100 J	4,020	5,340
Antimony	0.25 R	0.49 B	1.1 B	2 J	5.3 B	3.9 J	0.86 J	0.26 R
Arsenic	53.8 L	45.3	303 L	35.2 L	377 L	213 L	99.3 L	25.2
Barium	44.9	62	49.4 J	511	43.2 J	44.2	395	38.8 J
Beryllium	0.12 B	0.27 B	0.29 B	0.24 B	0.25 B	0.19 B	0.21 B	0.28 B
Cadmium	3.7	10	0.32 J	45	1.2 K	0.96 J	80	26.5
Calcium	248 J	960 J	443 J	1,910	448 J	389 J	1,460	226 J
Chromium	3.7 J	9	8.2 J	24.1	6.5 J	6.6 J	18.8	9.2
Cobalt	0.97 J	5.4 J	4.8 J	5.2 J	4 J	3.1 J	3.4 J	3.2 J
Copper	7.2 K	29.5	13.8 K	370	14.1	13.7	460	24.8
Iron	5,280	16,600	13,500	21,400	9,300	5,530	16,000	17,900
Lead	23.4 K	346	56.5 K	2,800	160 K	115 K	3,540 J	526
Magnesium	145 J	421 J	567 J	1,720	344 J	377 J	699 J	455 J
Manganese	22.5 J	251	38 J	273	104 J	71.4 J	202 J	112
Mercury	0.09 B	0.25	0.18 B	1.1	0.09 B	0.09 B	0.31	0.12 K
Nickel	2.18 U	8.4 B	4.5 J	39.4	4.8 J	2.9 J	14.8 K	5.7 J
Potassium	235 J	331 B	706 J	414 J	318 J	340 J	357 J	306 J
Selenium	0.39 U	0.47 U	0.78 U	0.33 J	0.61 B	0.44 U	0.44 U	0.79 B
Silver	0.89 U	1.07 U	1.78 U	0.94 J	1.11 U	1 U	1.7 J	0.93 U
Sodium	33.2 B	27 B	41.5 B	40.3 B	34.3 B	36.2 B	42.5 B	33.7 B
Vanadium	9.8 J	17.4 K	24.8 J	20.4	13 J	11.4 J	16.2 K	16.2 K
Zinc	1,450	3,940	95.5	20,900	358	319	71,900 L	21,600
Wet Chemistry (MG/KG)								

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Table 4-1
Detected Compounds in Surface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28MM20	IS28MM23	IS28MM28	IS28MM42	IS28SO04		IS28SO08	IS28SO09
Sample ID	IS28SS20-0001	IS28SS23-0001	IS28SS28-0001	IS28SS42-0001	IS28SS04-0001	IS28SS04-0001P	IS28SS08-0001	IS28SS09-0001
Sample Date	05/20/03	05/15/03	05/20/03	05/14/03	05/20/03	05/20/03	05/13/03	05/12/03
Chemical Name								
% Solids	89	75	61	82	75	75	79	90
Total organic carbon (TOC)	8,000	39,000	78,000	49,000	25,000	21,000	22,000	5,800
pH	6.4	6.9	4.3	6.8	6.2	5.9	7.1	7.6

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Table 4-1
Detected Compounds in Surface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28SO10	IS28SO12	IS28SO13	IS28SO15	IS28SO17	IS28SO18	IS28SO19	IS28
Sample ID	IS28SS10-0001	IS28SS12-0001	IS28SS13-0001	IS28SS15-0001	IS28SS17-0001	IS28SS18-0001	IS28SS19-0001	IS28SS21-0001
Sample Date	05/13/03	05/20/03	05/13/03	05/13/03	05/12/03	05/13/03	05/13/03	05/19/03
Chemical Name								
Volatile Organic Compounds (UG/KG)								
1,2-Dichloroethene (total)	NA	2 L	NA	NA	NA	NA	NA	2 L
Cumene	14 U	15 UL	13 U	13 U	12 U	13 U	13 U	17 UL
Methyl acetate	14 U	15 UL	13 U	13 U	12 U	13 U	13 U	17 UL
Methyl-tert-butyl ether (MTBE)	0.4 J	15 UL	1 J	13 U	12 U	13 U	2 J	5 L
Styrene	14 U	15 UL	13 U	13 U	12 U	13 U	13 U	17 UL
Xylene, total	14 U	15 UL	13 U	13 U	12 U	13 U	13 U	17 UL
cis-1,2-Dichloroethene	14 U	2 L	13 U	13 U	12 U	13 U	13 U	2 L
m- and p-Xylene	NA	15 UL	NA	NA	NA	NA	NA	17 UL
Semi-volatile Organic Compounds (UG/KG)								
1,1-Biphenyl	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
2,4,5-Trichlorophenol	1,300 U	1,200 U	1,100 U	1,000 U	1,000 U	1,100 U	6,000 U	1,500 U
2,4,6-Trichlorophenol	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
2,4-Dichlorophenol	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
2,4-Dimethylphenol	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
2,4-Dinitrotoluene	1,200	480 U	450 U	170 J	400 U	420 U	2,400 U	590 U
2,6-Dinitrotoluene	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
2-Chloronaphthalene	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
2-Chlorophenol	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
2-Methylnaphthalene	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
2-Methylphenol	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
2-Nitroaniline	1,300 U	1,200 U	1,100 U	1,000 U	1,000 U	1,100 U	6,000 U	1,500 U
2-Nitrophenol	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
4,6-Dinitro-2-methylphenol	1,300 U	1,200 U	1,100 U	1,000 U	1,000 U	1,100 U	6,000 U	1,500 U
4-Bromophenyl-phenylether	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
4-Chloro-3-methylphenol	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
4-Chlorophenyl-phenylether	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
4-Methylphenol	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Acenaphthene	500 U	480 U	450 U	420 U	25 J	420 U	2,400 U	590 U
Acenaphthylene	500 U	480 U	450 U	420 U	28 J	22 J	2,400 U	590 U
Acetophenone	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Anthracene	500 U	480 U	450 U	420 U	400 U	44 J	2,400 U	590 U
Atrazine	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U

B - Not detected above blank
J - Estimated
K -Biased high
L - Biased low
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R - Unreliable
U - Not detected
UJ - Not detected, Estimated
UL - Not detected, biased low

Table 4-1
Detected Compounds in Surface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28SO10	IS28SO12	IS28SO13	IS28SO15	IS28SO17	IS28SO18	IS28SO19	IS28
Sample ID	IS28SS10-0001	IS28SS12-0001	IS28SS13-0001	IS28SS15-0001	IS28SS17-0001	IS28SS18-0001	IS28SS19-0001	IS28SS21-0001
Sample Date	05/13/03	05/20/03	05/13/03	05/13/03	05/12/03	05/13/03	05/13/03	05/19/03
Chemical Name								
Benzaldehyde	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Benzo(a)anthracene	69 J	480 U	110 J	540	190 J	170 J	2,400 U	57 J
Benzo(a)pyrene	75 J	480 U	160 J	810	210 J	130 J	2,400 U	59 J
Benzo(b)fluoranthene	120 J	480 U	180 J	1,700	360 J	300 J	2,400 U	86 J
Benzo(g,h,i)perylene	500 U	480 U	450 U	420 U	140 J	56 J	2,400 U	590 U
Benzo(k)fluoranthene	47 J	480 U	100 J	660	140 J	150 J	2,400 U	32 J
Bis(2-chloro-1-methylethyl) ether	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Butylbenzylphthalate	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Caprolactam	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Carbazole	500 U	480 U	450 U	22 J	40 J	420 U	2,400 U	590 U
Chrysene	90 J	480 U	140 J	620	330 J	210 J	2,400 U	65 J
Di-n-butylphthalate	160 B	480 U	30 B	230 B	42 B	28 B	1,100 B	590 U
Di-n-octylphthalate	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Dibenz(a,h)anthracene	500 U	480 U	32 J	230 J	43 J	32 J	2,400 U	590 U
Dibenzofuran	500 U	480 U	450 U	420 U	52 J	420 U	2,400 U	590 U
Diethylphthalate	500 U	480 U	450 U	420 U	400 U	420 U	160 J	590 U
Dimethyl phthalate	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Fluoranthene	120 J	480 U	140 J	380 J	850	260 J	2,400 U	120 J
Fluorene	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Hexachlorobenzene	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Hexachlorobutadiene	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Hexachlorocyclopentadiene	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Hexachloroethane	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Indeno(1,2,3-cd)pyrene	74 J	480 U	130 J	1,100	160 J	120 J	2,400 U	42 J
Isophorone	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Naphthalene	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Nitrobenzene	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Pentachlorophenol	1,300 U	1,200 U	1,100 U	1,000 U	1,000 U	1,100 U	6,000 U	1,500 U
Phenanthrene	46 J	480 U	35 J	79 J	740	26 J	2,400 U	41 J
Phenol	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Pyrene	110 J	480 U	150 J	340 J	550	250 J	2,400 U	92 J
bis(2-Chloroethoxy)methane	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
bis(2-Chloroethyl)ether	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
bis(2-Ethylhexyl)phthalate	110 B	140 B	120 B	260 B	400 U	420 U	440 B	75 J
n-Nitroso-di-n-propylamine	500 U	480 UL	450 U	420 U	400 U	420 U	2,400 U	590 U

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Table 4-1
Detected Compounds in Surface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28SO10	IS28SO12	IS28SO13	IS28SO15	IS28SO17	IS28SO18	IS28SO19	IS28
Sample ID	IS28SS10-0001	IS28SS12-0001	IS28SS13-0001	IS28SS15-0001	IS28SS17-0001	IS28SS18-0001	IS28SS19-0001	IS28SS21-0001
Sample Date	05/13/03	05/20/03	05/13/03	05/13/03	05/12/03	05/13/03	05/13/03	05/19/03
Chemical Name								
n-Nitrosodiphenylamine	160 J	480 U	450 U	610	23 J	61 J	12,000	590 U
Explosives (UG/KG)								
1,3,5-Trinitrobenzene	100 U	100 U	100 U	100 U	100 U	100 U	100 UL	100 UL
2,4,6-Trinitrotoluene	100 UL	100 U	100 UL	290 L	100 UL	100 UL	100 UL	100 U
2,4-Dinitrotoluene	100 U	100 U	100 U	79 J	100 U	100 U	220 L	100 U
HMX	200 U	200 U	200 U	200 U	200 U	200 U	200 UL	200 U
Nitrobenzene	100 U	68 J	100 U	67 J	100 UL	100 U	150 L	100 U
Tetryl	200 U	200 U	200 U	200 U	200 U	200 U	200 UL	200 UL
Total Metals (MG/KG)								
Aluminum	7,720	8,050 J	9,550	6,140	6,700	3,560	9,060	4,450
Antimony	0.67 J	0.33 B	0.3 R	2.8 J	0.29 R	0.23 R	16.3 L	1.9 B
Arsenic	18.4 L	6.8 L	15.6 L	10.5 L	30.3	145 L	29 L	284 L
Barium	169	48.6 J	118	935	46.7	193	1,550	137
Beryllium	0.15 U	0.6 J	0.19 B	0.12 B	0.24 B	0.18 B	0.24 B	0.35 B
Cadmium	31.8	0.07 U	9.8	36.7	13.2	57.2	141	2.5 K
Calcium	23,500	1,180 J	23,400	1,760	1,160	327 J	8,470	3,880
Chromium	72.6	13.7 J	66.3	36.4	14.7	11.6	169	10.2 J
Cobalt	5.8 J	2.5 J	5.2 J	3.2 J	3.2 J	8.8 K	6.2 J	5.8 J
Copper	155	19.3	205	799	33.8	252	1,270	27.1
Iron	84,600	44,400	27,600	41,000	13,500	32,400	36,200	12,600
Lead	1,180 J	10.7 K	282 J	3,650 J	259	1,990	10,300 J	157
Magnesium	1,360 J	770 J	1,270	2,160	774 J	481 J	2,580	1,610
Manganese	711 J	25.1 J	393 J	333 J	93.6	459	476 J	533
Mercury	1.3	0.09 B	0.99	11.5	0.29	0.19 B	0.84	0.24
Nickel	20.6 K	2.94 U	15.5 K	31.4	12.5 K	10.2 K	44.1	10.4 J
Potassium	371 J	459 J	484 J	540 J	508 J	234 J	833 J	621 J
Selenium	1.3 J	0.53 U	1.1 K	0.58 J	0.55 B	0.66 J	0.44 U	0.63 J
Silver	16.1	1.2 U	11	3.6 K	1.3 B	0.96 J	4.8	1.4 U
Sodium	99.3 B	66.2 B	57.7 B	58.8 B	27.3 B	36.4 B	141 B	98.8 J
Vanadium	70.4	50.2 J	59.8	22.1	22 K	11.4 K	24.8	21.5 K
Zinc	13,400 L	927	5,760 L	22,600 L	6,120	48,200	63,200 L	796
Wet Chemistry (MG/KG)								

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Table 4-1
Detected Compounds in Surface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28SO10	IS28SO12	IS28SO13	IS28SO15	IS28SO17	IS28SO18	IS28SO19	IS28
Sample ID	IS28SS10-0001	IS28SS12-0001	IS28SS13-0001	IS28SS15-0001	IS28SS17-0001	IS28SS18-0001	IS28SS19-0001	IS28SS21-0001
Sample Date	05/13/03	05/20/03	05/13/03	05/13/03	05/12/03	05/13/03	05/13/03	05/19/03
Chemical Name								
% Solids	66	79	71	80	91	77	84	53
Total organic carbon (TOC)	62,000	7,400	69,000	26,000	17,000	19,000	72,000	90,000
pH	7.5	6	7.8	6.5	7.4	6.4	7.4	6.5

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Table 4-1
Detected Compounds in Surface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	SO21	IS28SO22	IS28SO24	IS28SO26	IS28SO27	IS28SO29	IS28SO32	IS28SO33
Sample ID	IS28SS21-0001P	IS28SS22-0001	IS28SS24-0001	IS28SS26-0001	IS28SS27-0001	IS28SS29-0001	IS28SS32-0001	IS28SS33-0001
Sample Date	05/19/03	05/14/03	05/14/03	05/19/03	05/16/03	05/19/03	05/19/03	05/19/03
Chemical Name								
Volatile Organic Compounds (UG/KG)								
1,2-Dichloroethene (total)	2 J	NA	NA	2 L	NA	1 L	4 B	3 L
Cumene	18 UJ	13 U	12 U	12 UL	13 U	13 UL	18 U	22 UJ
Methyl acetate	18 UJ	13 U	12 U	12 UL	13 U	13 UL	18 U	22 UL
Methyl-tert-butyl ether (MTBE)	9 J	13 U	12 U	3 L	13 U	4 L	5 J	11 L
Styrene	18 UJ	13 U	12 U	12 UL	9 J	13 UL	18 U	22 UJ
Xylene, total	2 J	13 U	12 U	12 UL	13 U	13 UL	18 U	22 UJ
cis-1,2-Dichloroethene	2 J	13 U	12 U	2 L	13 U	1 L	4 B	3 L
m- and p-Xylene	2 J	NA	NA	12 UL	NA	13 UL	18 U	22 UJ
Semi-volatile Organic Compounds (UG/KG)								
1,1-Biphenyl	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
2,4,5-Trichlorophenol	1,600 U	1,100 U	970 U	1,100 U	1,200 U	1,000 U	1,400 U	1,800 U
2,4,6-Trichlorophenol	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
2,4-Dichlorophenol	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
2,4-Dimethylphenol	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
2,4-Dinitrotoluene	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
2,6-Dinitrotoluene	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
2-Chloronaphthalene	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
2-Chlorophenol	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
2-Methylnaphthalene	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
2-Methylphenol	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
2-Nitroaniline	1,600 U	1,100 U	970 U	1,100 U	1,200 U	1,000 U	1,400 U	1,800 U
2-Nitrophenol	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
4,6-Dinitro-2-methylphenol	1,600 U	1,100 U	970 U	1,100 U	1,200 U	1,000 U	1,400 U	1,800 U
4-Bromophenyl-phenylether	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
4-Chloro-3-methylphenol	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
4-Chlorophenyl-phenylether	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
4-Methylphenol	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Acenaphthene	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Acenaphthylene	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Acetophenone	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Anthracene	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Atrazine	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U

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Table 4-1
Detected Compounds in Surface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	SO21	IS28SO22	IS28SO24	IS28SO26	IS28SO27	IS28SO29	IS28SO32	IS28SO33
Sample ID	IS28SS21-0001P	IS28SS22-0001	IS28SS24-0001	IS28SS26-0001	IS28SS27-0001	IS28SS29-0001	IS28SS32-0001	IS28SS33-0001
Sample Date	05/19/03	05/14/03	05/14/03	05/19/03	05/16/03	05/19/03	05/19/03	05/19/03
Chemical Name								
Benzaldehyde	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Benzo(a)anthracene	60 J	430 U	380 U	51 J	470 U	420 U	36 J	720 U
Benzo(a)pyrene	44 J	430 U	380 U	65 J	470 U	420 U	34 J	720 U
Benzo(b)fluoranthene	620 U	26 J	380 U	98 J	24 J	420 U	73 J	720 U
Benzo(g,h,i)perylene	620 U	430 U	380 U	51 J	62 J	420 U	580 U	720 U
Benzo(k)fluoranthene	620 U	430 U	380 U	39 J	470 U	420 U	580 U	720 U
Bis(2-chloro-1-methylethyl) ether	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Butylbenzylphthalate	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Caprolactam	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Carbazole	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Chrysene	72 J	430 U	380 U	62 J	25 J	420 U	57 J	720 U
Di-n-butylphthalate	62 J	430 U	250 J	420 U	470 U	420 U	580 U	720 U
Di-n-octylphthalate	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Dibenz(a,h)anthracene	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Dibenzofuran	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Diethylphthalate	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Dimethyl phthalate	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Fluoranthene	89 J	430 U	34 J	80 J	28 J	20 J	74 J	62 J
Fluorene	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Hexachlorobenzene	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Hexachlorobutadiene	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Hexachlorocyclopentadiene	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Hexachloroethane	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Indeno(1,2,3-cd)pyrene	620 U	430 U	380 U	61 J	470 U	420 U	31 J	720 U
Isophorone	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Naphthalene	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Nitrobenzene	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Pentachlorophenol	1,600 U	1,100 U	970 U	1,100 U	1,200 U	1,000 U	1,400 U	1,800 U
Phenanthrene	36 J	430 U	22 J	420 U	470 U	420 U	34 J	720 U
Phenol	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Pyrene	83 J	430 U	34 J	110 J	37 J	23 J	71 J	56 J
bis(2-Chloroethoxy)methane	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
bis(2-Chloroethyl)ether	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
bis(2-Ethylhexyl)phthalate	330 J	430 U	380 U	33 B	470 U	420 U	580 U	150 J
n-Nitroso-di-n-propylamine	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U

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Table 4-1
Detected Compounds in Surface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	SO21	IS28SO22	IS28SO24	IS28SO26	IS28SO27	IS28SO29	IS28SO32	IS28SO33
Sample ID	IS28SS21-0001P	IS28SS22-0001	IS28SS24-0001	IS28SS26-0001	IS28SS27-0001	IS28SS29-0001	IS28SS32-0001	IS28SS33-0001
Sample Date	05/19/03	05/14/03	05/14/03	05/19/03	05/16/03	05/19/03	05/19/03	05/19/03
Chemical Name								
n-Nitrosodiphenylamine	620 U	430 U	380 U	24 J	470 U	420 U	580 U	720 U
Explosives (UG/KG)								
1,3,5-Trinitrobenzene	100 UL	100 U	100 U	100 U	100 U	100 U	100 UL	100 UL
2,4,6-Trinitrotoluene	100 U	120 L	450 L	100 U	100 UL	100 U	100 U	100 U
2,4-Dinitrotoluene	100 U	100 U	230	100 U	100 U	100 U	100 U	100 U
HMX	200 U	200 U	200 U	200 U	200 UL	200 U	200 U	200 U
Nitrobenzene	100 U	100 UL	100 UL	100 U	100 UL	100 U	99 J	100 U
Tetryl	200 UL	140 J	620	200 U	200 U	200 U	200 UL	200 UL
Total Metals (MG/KG)								
Aluminum	4,800	13,100	4,830	1,880 J	4,900	3,790 J	6,100	2,820
Antimony	2 B	0.57 R	0.19 R	0.28 R	0.34 B	0.84 B	0.39 R	0.51 B
Arsenic	286 L	17 L	50.6 L	7.1 L	141	210 L	17 L	27.4 L
Barium	138	39.4 J	28.5 J	15.1 J	28.9 J	22.8 J	75.3	41.5 J
Beryllium	0.33 B	2 J	0.15 B	0.13 B	0.37 B	0.25 B	0.42 B	0.11 U
Cadmium	2.1 K	1.56 U	0.53 U	2.8	2.5	1.4 K	1.08 U	1.27 U
Calcium	3,860	583 J	88.4 J	156 J	442 J	185 J	1,790	983 J
Chromium	8 J	16.5	9.3	5.3 J	5.2	5 J	11.6 J	3.6 J
Cobalt	5.9 J	11.4 J	1.7 J	1.6 J	6.5 J	4 J	5.6 J	4.1 J
Copper	33.5	18.9	8.2	7.6 K	11.2 K	10.4	19.5	10.4 K
Iron	12,500	56,100	15,300	5,430	15,300	7,250	16,100	4,620
Lead	164	17.1	17.6	72.8 K	135	56.2 K	44	32
Magnesium	1,630	1,050 J	243 J	245 J	435 J	313 J	658 J	383 J
Manganese	555	79.7	23	39.2 J	392	66 J	236	53.8
Mercury	0.25	0.09 B	0.06 B	0.06 B	0.08 B	0.09 B	0.26	0.03 U
Nickel	9.3 J	19.8 K	4.4 J	2.44 U	6.3 B	3.2 J	11.2 J	5.8 J
Potassium	688 J	1,310 J	267 J	282 J	491 B	372 J	658 J	367 J
Selenium	1.1 J	1 J	0.74 K	0.45 B	0.52 U	0.56 B	0.62 U	0.73 U
Silver	1.41 U	2.3 J	1 J	1 U	1.19 U	0.92 U	1.41 U	1.66 U
Sodium	81 J	46.9 B	19.2 B	17.6 B	52.2 B	25.6 B	38.6 B	59.9 B
Vanadium	21.9 K	55.3	16.1	11 J	19.7 K	13.8 J	30	12.8 J
Zinc	795	316	59	1,080	585	284	64.5	44.4
Wet Chemistry (MG/KG)								

B - Not detected above blank
J - Estimated
K -Biased high
L - Biased low
JB - Estimated, not detected above blank

R - Unreliable
U - Not detected
UJ - Not detected, Estimated
UL - Not detected, biased low

Table 4-1
Detected Compounds in Surface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	SO21	IS28SO22	IS28SO24	IS28SO26	IS28SO27	IS28SO29	IS28SO32	IS28SO33
Sample ID	IS28SS21-0001P	IS28SS22-0001	IS28SS24-0001	IS28SS26-0001	IS28SS27-0001	IS28SS29-0001	IS28SS32-0001	IS28SS33-0001
Sample Date	05/19/03	05/14/03	05/14/03	05/19/03	05/16/03	05/19/03	05/19/03	05/19/03
Chemical Name								
% Solids	54	77	82	81	68	83	57	54
Total organic carbon (TOC)	99,000	7,200	29,000	9,800	17,000	14,000	240,000	110,000
pH	6.4	5.9	5.5	6.5	5	6.3	5.4	4.9

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L - Biased low
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Table 4-1
Detected Compounds in Surface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28SO35	IS28SO36	IS28SO37	IS28SO38	IS28SO40		IS28SO41
Sample ID	IS28SS35-0001	IS28SS36-0001	IS28SS37-0001	IS28SS38-0001	IS28SS40-0001	IS28SS40-0001P	IS28SS41-0001
Sample Date	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03
Chemical Name							
Volatile Organic Compounds (UG/KG)							
1,2-Dichloroethene (total)	4 B	3 B	3 B	2 J	5 B	3 B	2 J
Cumene	17 U	11 UL	11 U	16 UJ	21 UL	20 UL	7 J
Methyl acetate	17 U	11 UL	6 J	16 UJ	21 UL	20 UL	23 U
Methyl-tert-butyl ether (MTBE)	2 J	1 L	2 J	5 J	21 UL	20 UL	2 J
Styrene	17 U	11 UL	11 U	16 UJ	21 UL	20 UL	23 U
Xylene, total	17 U	11 UL	11 U	16 UJ	21 UL	20 UL	23 U
cis-1,2-Dichloroethene	4 B	3 B	3 B	2 J	5 B	3 B	2 J
m- and p-Xylene	17 U	11 UL	11 U	16 UJ	21 UL	20 UL	23 U
Semi-volatile Organic Compounds (UG/KG)							
1,1-Biphenyl	560 U	120 R	370 U	520 U	680 R	660 U	740 U
2,4,5-Trichlorophenol	1,400 U	130 R	930 U	1,300 U	1,700 R	1,700 U	1,800 U
2,4,6-Trichlorophenol	560 U	100 R	370 U	520 U	680 R	660 U	740 U
2,4-Dichlorophenol	560 U	100 R	370 U	520 U	680 R	660 U	740 U
2,4-Dimethylphenol	560 U	77 R	370 U	520 U	680 R	660 U	740 U
2,4-Dinitrotoluene	560 U	100 R	370 U	520 U	680 R	660 U	740 U
2,6-Dinitrotoluene	560 U	110 R	370 U	520 U	680 R	660 U	740 U
2-Chloronaphthalene	560 U	110 R	370 U	520 U	680 R	660 U	740 U
2-Chlorophenol	560 U	100 R	370 U	520 U	680 R	660 U	740 U
2-Methylnaphthalene	560 U	150 R	370 U	520 U	680 R	660 U	740 U
2-Methylphenol	560 U	86 R	370 U	520 U	680 R	660 U	740 U
2-Nitroaniline	1,400 U	64 R	930 U	1,300 U	1,700 R	1,700 U	1,800 U
2-Nitrophenol	560 U	100 R	370 U	520 U	680 R	660 U	740 U
4,6-Dinitro-2-methylphenol	1,400 U	98 R	930 U	1,300 U	1,700 R	1,700 U	1,800 U
4-Bromophenyl-phenylether	560 U	120 R	370 U	520 U	680 R	660 U	740 U
4-Chloro-3-methylphenol	560 U	82 R	370 U	520 U	680 R	660 U	740 U
4-Chlorophenyl-phenylether	560 U	120 R	370 U	520 U	680 R	660 U	740 U
4-Methylphenol	560 U	80 R	370 U	520 U	680 R	660 U	740 U
Acenaphthene	560 U	130 R	370 U	520 U	680 R	660 U	740 U
Acenaphthylene	560 U	120 R	370 U	520 U	680 R	660 U	740 U
Acetophenone	560 U	100 R	370 U	520 U	680 R	660 U	740 U
Anthracene	33 J	120 R	370 U	520 U	680 R	660 U	740 U
Atrazine	560 U	100 R	370 U	520 U	680 R	660 U	740 U

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U - Not detected
UJ - Not detected, Estimated
UL - Not detected, biased low

Table 4-1
Detected Compounds in Surface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28SO35	IS28SO36	IS28SO37	IS28SO38	IS28SO40		IS28SO41
Sample ID	IS28SS35-0001	IS28SS36-0001	IS28SS37-0001	IS28SS38-0001	IS28SS40-0001	IS28SS40-0001P	IS28SS41-0001
Sample Date	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03
Chemical Name							
Benzaldehyde	560 U	150 R	370 U	520 U	680 R	660 U	740 U
Benzo(a)anthracene	160 J	150 R	370 U	67 J	92 J	120 J	130 J
Benzo(a)pyrene	120 J	150 R	370 U	46 J	64 J	110 J	130 J
Benzo(b)fluoranthene	220 J	160 R	31 J	62 J	130 J	170 J	210 J
Benzo(g,h,i)perylene	560 U	130 R	370 U	520 U	680 R	660 U	64 J
Benzo(k)fluoranthene	86 J	150 R	370 U	37 J	47 J	65 J	91 J
Bis(2-chloro-1-methylethyl) ether	560 U	100 R	370 U	520 U	680 R	660 U	740 U
Butylbenzylphthalate	560 U	120 R	370 U	520 U	680 R	660 U	740 U
Caprolactam	560 U	86 R	370 U	520 U	680 R	660 U	740 U
Carbazole	560 U	140 R	370 U	520 U	680 R	660 U	740 U
Chrysene	160 J	170 R	370 U	76 J	120 J	150 J	180 J
Di-n-butylphthalate	31 J	120 R	370 U	520 U	680 R	54 J	740 U
Di-n-octylphthalate	560 U	120 R	370 U	520 U	680 R	660 U	740 U
Dibenz(a,h)anthracene	29 J	130 R	370 U	520 U	680 R	660 U	740 U
Dibenzofuran	560 U	120 R	370 U	520 U	680 R	660 U	740 U
Diethylphthalate	560 U	130 R	370 U	520 U	680 R	660 U	740 U
Dimethyl phthalate	560 U	110 R	370 U	520 U	680 R	660 U	740 U
Fluoranthene	240 J	200 R	44 J	120 J	180 J	220 J	190 J
Fluorene	560 U	120 R	370 U	520 U	680 R	660 U	740 U
Hexachlorobenzene	560 U	130 R	370 U	520 U	680 R	660 U	740 U
Hexachlorobutadiene	560 U	120 R	370 U	520 U	680 R	660 U	740 U
Hexachlorocyclopentadiene	560 U	79 R	370 U	520 U	680 R	660 U	740 U
Hexachloroethane	560 U	95 R	370 U	520 U	680 R	660 U	740 U
Indeno(1,2,3-cd)pyrene	89 J	140 R	370 U	33 J	50 J	56 J	100 J
Isophorone	560 U	110 R	370 U	520 U	680 R	660 U	740 U
Naphthalene	560 U	110 R	370 U	520 U	680 R	660 U	740 U
Nitrobenzene	560 U	120 R	370 U	520 U	680 R	660 U	740 U
Pentachlorophenol	1,400 U	130 R	930 U	1,300 U	1,700 R	1,700 U	1,800 U
Phenanthrene	36 J	170 R	370 U	37 J	100 J	100 J	91 J
Phenol	560 U	100 R	370 U	520 U	680 R	660 U	740 U
Pyrene	210 J	160 R	22 J	99 J	180 J	190 J	230 J
bis(2-Chloroethoxy)methane	560 U	110 R	370 U	520 U	680 R	660 U	740 U
bis(2-Chloroethyl)ether	560 U	110 R	370 U	520 U	680 R	660 U	740 U
bis(2-Ethylhexyl)phthalate	120 J	160 R	370 U	520 U	89 B	110 B	140 J
n-Nitroso-di-n-propylamine	560 U	100 R	370 U	520 U	680 R	660 U	740 UL

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K -Biased high
L - Biased low
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R - Unreliable
U - Not detected
UJ - Not detected, Estimated
UL - Not detected, biased low

Table 4-1
Detected Compounds in Surface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28SO35	IS28SO36	IS28SO37	IS28SO38	IS28SO40		IS28SO41
Sample ID	IS28SS35-0001	IS28SS36-0001	IS28SS37-0001	IS28SS38-0001	IS28SS40-0001	IS28SS40-0001P	IS28SS41-0001
Sample Date	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03
Chemical Name							
n-Nitrosodiphenylamine	560 U	92 R	370 U	520 U	680 R	660 U	740 U
Explosives (UG/KG)							
1,3,5-Trinitrobenzene	100 UL	100 UL	100 UL	100 UL	100 UL	100 UL	100 UL
2,4,6-Trinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2,4-Dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U
HMX	200 U	200 U	230	200 U	200 U	200 U	200 UL
Nitrobenzene	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Tetryl	200 UL	200 UL	200 UL	200 UL	200 UL	200 UL	200 UL
Total Metals (MG/KG)							
Aluminum	3,620	1,530	3,780	6,540	5,740	5,380	6,860
Antimony	0.37 R	0.27 R	0.26 R	0.34 R	0.87 B	1.1 B	0.51 R
Arsenic	20.3 L	5.4 L	2.8 L	31.2 L	190 L	193 L	66.8 L
Barium	31.6 J	13.4 J	28.8 J	60.6	152	152	112
Beryllium	0.58 B	0.12 B	0.7 J	0.44 B	0.34 B	0.27 B	0.67 B
Cadmium	1.02 U	2.5	0.72 U	0.94 U	1.33 U	1.24 U	1.41 U
Calcium	648 J	154 J	637 J	843 J	1,960	2,430	3,920
Chromium	5.8 J	3.2 J	5.1 J	10.3 J	9.8 J	8.5 J	10.6 J
Cobalt	6.1 J	1.2 J	6 J	5.4 J	6.8 J	7.9 J	13.2 J
Copper	18.5	6.6 K	8.2 K	15.8	25.4	24.8	28.8
Iron	10,500	4,160	12,000	19,200	17,700	16,700	16,800
Lead	19.1	46.6	17	36.1	101	89.3	65.3
Magnesium	581 J	226 J	762 J	693 J	734 J	779 J	1,090 J
Manganese	106	26.7	184	114	227	324	312
Mercury	0.08 B	0.17	0.11 B	0.28	0.26	0.19 B	0.16 B
Nickel	10.4 J	2.8 J	9.6 K	12.2 K	10.4 J	13.6 J	19 K
Potassium	609 J	222 J	694 J	691 J	760 J	724 J	899 J
Selenium	0.59 U	0.43 U	0.41 U	0.54 U	0.78 J	1 J	0.81 U
Silver	1.34 U	0.97 U	0.94 U	1.23 U	1.74 U	1.62 U	1.84 U
Sodium	35.4 B	25.4 B	20.2 B	44 B	100 J	123 J	112 J
Vanadium	17 K	11.9 K	21.1	21.1	17.9 J	15.7 J	23.3 K
Zinc	59.9	875	76.3	112	145	155	647
Wet Chemistry (MG/KG)							

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UL - Not detected, biased low

Table 4-1
Detected Compounds in Surface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28SO35	IS28SO36	IS28SO37	IS28SO38	IS28SO40		IS28SO41
Sample ID	IS28SS35-0001	IS28SS36-0001	IS28SS37-0001	IS28SS38-0001	IS28SS40-0001	IS28SS40-0001P	IS28SS41-0001
Sample Date	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03
Chemical Name							
% Solids	67	70	65	69	50	50	49
Total organic carbon (TOC)	38,000	43,000	40,000	46,000	86,000	62,000	120,000
pH	5.3	4.5	5.2	6.1	5.9	6.1	6.3

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UJ - Not detected, Estimated
UL - Not detected, biased low

Table 4-2
Detected Compounds in Background Surface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28MM01	IS28MM16	IS28SO34	IS28SO39
Sample ID	IS28SS01-0001	IS28SS16-0001	IS28SS34-0001	IS28SS39-0001
Sample Date	05/15/03	05/14/03	05/16/03	05/16/03
Chemical Name				
Semi-volatile Organic Compounds (UG/KG)				
Acenaphthylene	460 U	380 U	140 J	160 J
Anthracene	460 U	36 J	200 J	160 J
Benzaldehyde	460 U	380 U	390 U	54 J
Benzo(a)anthracene	85 J	170 J	1,100	1,100
Benzo(a)pyrene	80 J	160 J	650	860
Benzo(b)fluoranthene	140 J	330 J	1,900	1,700
Benzo(g,h,i)perylene	52 J	170 J	94 J	150 J
Benzo(k)fluoranthene	66 J	130 J	770	640
Butylbenzylphthalate	390 J	380 U	390 U	600 U
Carbazole	460 U	380 U	25 J	600 U
Chrysene	120 J	210 J	1,300	1,400
Dibenz(a,h)anthracene	460 U	81 J	200 J	170 J
Diethylphthalate	33 J	380 U	390 U	600 U
Fluoranthene	130 J	230 J	1,100	1,200
Indeno(1,2,3-cd)pyrene	77 J	200 J	610	610
Phenanthrene	27 J	58 J	62 J	200 J
Pyrene	130 J	260 J	1,300	1,200
bis(2-Ethylhexyl)phthalate	430 J	55 J	390 U	600 U
n-Nitrosodiphenylamine	460 U	29 J	390 U	600 U
Explosives (UG/KG)				
2,4,6-Trinitrotoluene	100 UL	150 L	100 UL	100 UL
Nitrobenzene	100 UL	37 L	100 UL	100 UL
Total Metals (MG/KG)				
Aluminum	5,780	6,570	1,760	4,260
Arsenic	17.3	50.6 L	24.8	139
Barium	41.4 J	98.4	12.9 J	66.4
Cadmium	1.2 K	2.8 B	0.63 U	1.6 K
Calcium	1,430	1,560	421 J	651 J
Chromium	11.2	13.5	5.4	8.8
Cobalt	3.1 J	4.9 J	1.4 B	12.4 J
Copper	11.5	25.9	4.4 B	50

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L - Biased low
JB - Estimated, not detected above blank

R - Unreliable
U - Not detected
UJ - Not detected, Estimated
UL - Not detected, biased low

Table 4-2
Detected Compounds in Background Surface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28MM01	IS28MM16	IS28SO34	IS28SO39
Sample ID	IS28SS01-0001	IS28SS16-0001	IS28SS34-0001	IS28SS39-0001
Sample Date	05/15/03	05/14/03	05/16/03	05/16/03
Chemical Name				
Iron	12,500	15,200	5,430	17,400
Lead	21.6	251	10.7	37.3
Magnesium	786 J	2,150	188 J	589 J
Manganese	176	151	139	131
Mercury	0.05 B	0.18 B	0.2	0.16 B
Nickel	10.5 B	29.2	5.6 B	20.5 B
Potassium	353 B	446 J	88.3 U	346 B
Selenium	0.52 B	0.45 J	0.36 U	0.61 U
Silver	1.07 U	1.2 J	0.82 U	1.4 U
Vanadium	18.5 K	42	6.9 J	21.8 K
Zinc	151	1,420	36.7	499
Wet Chemistry (MG/KG)				
% Solids	86	87	79	59
Total organic carbon (TOC)	32,000	28,000	15,000	43,000
pH	5.9	6.6	6.1	5.6

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K -Biased high
L - Biased low
JB - Estimated not detected above blank

R - Unreliable
U - Not detected
UJ - Not detected, Estimated
UL - Not detected biased low

Table 4-3
Detected Compounds in Subsurface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28MM02	IS28MM03	IS28MM05	IS28MM06	IS28MM07	IS28MM11	IS28MM14	IS28MM20
Sample ID	IS28SB02-0103	IS28SB03-0103	IS28SB05-0103	IS28SB06-0103	IS28SB07-0103	IS28SB11-0103	IS28SB14-0103	IS28SB20-0103
Sample Date	05/12/03	05/12/03	05/12/03	05/15/03	05/16/03	05/13/03	05/15/03	05/20/03
Chemical Name								
Volatile Organic Compounds (UG/KG)								
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	NA	2 B
2-Butanone	12 U	11 U	11 U	12 U	12 U	15 U	11 U	12 U
Acetone	12 U	11 U	11 U	12 U	12 U	24 B	11 U	13 J
Ethylbenzene	12 U	11 U	11 U	12 U	12 U	15 U	11 U	12 U
Methyl acetate	12 U	11 U	11 U	12 U	12 U	15 U	11 U	12 U
Methyl-tert-butyl ether (MTBE)	12 U	0.8 J	11 U	12 U	12 U	15 U	11 U	2 J
Methylene chloride	0.9 B	1 B	2 B	12 U	12 U	15 U	11 U	8 B
Trichloroethene	12 U	11 U	11 U	12 U	12 U	15 U	11 U	20
cis-1,2-Dichloroethene	12 U	11 U	11 U	12 U	12 U	15 U	11 U	2 B
Semi-volatile Organic Compounds (UG/KG)								
2,4-Dinitrotoluene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
2-Methylnaphthalene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Acenaphthene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Acenaphthylene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Anthracene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Benzaldehyde	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Benzo(a)anthracene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Benzo(a)pyrene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Benzo(b)fluoranthene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Benzo(g,h,i)perylene	380 U	400 U	380 U	390 U	36 J	440 U	15 J	390 U
Benzo(k)fluoranthene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Butylbenzylphthalate	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Carbazole	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Chrysene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Di-n-butylphthalate	24 B	400 U	48 B	390 U	410 U	440 U	390 U	390 U
Dibenz(a,h)anthracene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Dibenzofuran	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Diethylphthalate	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Fluoranthene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Fluorene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Indeno(1,2,3-cd)pyrene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Naphthalene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Phenanthrene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Phenol	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Pyrene	380 U	400 U	380 U	390 U	410 U	440 U	20 J	390 U
bis(2-Ethylhexyl)phthalate	380 U	400 U	380 U	390 U	410 U	440 U	390 U	41 B
n-Nitrosodiphenylamine	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Explosives (UG/KG)								
1,3,5-Trinitrobenzene	100 U	100 U	100 U	100 U	100 U	240	100 U	100 U
1,3-Dinitrobenzene	100 U	100 U	100 U	100 UL	100 UL	100 U	100 UL	100 U
2,4,6-Trinitrotoluene	100 UL	100 UL	100 UL	130 L	100 UL	100 UL	100 UL	100 U

B - Not detected above blank
J - Estimated
K -Biased high
L - Biased low
JB - Estimated, not detected above blank

R - Unreliable
U - Not detected
UJ - Not detected, Estimated
UL - Not detected, biased low

Table 4-3
Detected Compounds in Subsurface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28MM02	IS28MM03	IS28MM05	IS28MM06	IS28MM07	IS28MM11	IS28MM14	IS28MM20
Sample ID	IS28SB02-0103	IS28SB03-0103	IS28SB05-0103	IS28SB06-0103	IS28SB07-0103	IS28SB11-0103	IS28SB14-0103	IS28SB20-0103
Sample Date	05/12/03	05/12/03	05/12/03	05/15/03	05/16/03	05/13/03	05/15/03	05/20/03
Chemical Name								
2,4-Dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Nitrobenzene	100 UL	47 L	67 L	89 L	100 UL	100 U	69 L	100 U
Tetryl	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Total Metals (MG/KG)								
Aluminum	9,340	7,490	3,660	15,000	6,100	5,390	3,170	3,030 J
Antimony	0.28 R	0.28 B	0.3 B	0.29 B	0.22 U	0.3 R	0.28 U	0.28 R
Arsenic	15.4	81.7	85.2	8	22.4	19.6 L	8	3.3 L
Barium	37 J	36	25.9 J	57.2	18.3 J	33.6 J	16.7 J	21.9 J
Beryllium	0.21 B	0.24 B	0.19 B	0.48 B	0.12 B	0.57 J	0.12 B	0.07 U
Cadmium	0.76 U	1.8	4.9	0.75 U	0.65 J	0.82 U	57	0.06 U
Calcium	132 J	271 J	114 J	369 J	218 J	483 J	367 J	172 J
Chromium	10.1	9.4	4.6	20	7.3	14.5	4.5	7 J
Cobalt	3.2 J	3.4 J	2.6 J	8.8 J	0.91 B	2.5 J	2.8 J	1.1 J
Copper	4.8 J	9.5	12.9	10.4	3.5 B	19.7	50.8	2.6 B
Iron	9,670	8,200	3,400	22,400	6,400	32,500	5,010	2,960
Lead	6.1	48.4	134	15	3.9	14.1	1,090	4.6 K
Magnesium	663 J	638 J	257 J	2,120	328 J	544 J	216 J	168 J
Manganese	76.8	87.8	73.5	178	14.5	21.4	36.1	10.7 J
Mercury	0.05 B	0.03 B	0.06 B	0.04 B	0.02 U	0.05 B	0.03 B	0.04 B
Nickel	6.1 J	4.6 J	2.05 U	11.4 B	3.6 B	2.63 U	6.2 B	2.49 U
Potassium	402 J	333 J	142 J	838 B	207 B	402 J	108 U	348 J
Selenium	0.44 U	0.4 B	0.59 B	0.43 U	0.35 U	0.47 U	0.44 U	0.55 B
Silver	1.2 B	0.71 U	0.84 U	1.1 B	0.81 U	2.3	1.01 U	1.02 U
Sodium	31 B	20.4 B	20.2 B	39.1 B	22 B	67.6 B	20.6 B	42.5 B
Thallium	0.62 U	0.65 B	0.52 U	0.61 U	0.5 U	0.67 U	0.63 U	0.63 UL
Vanadium	17.8 K	17.8	8.5 J	35.3	12.1 K	70.2	9.1 J	9.6 J
Zinc	52.6	991	2,680	113	29.6	312	25,100	38.5
Wet Chemistry (MG/KG)								
% Solids	88	91	88	84	83	70	81	85

B - Not detected above blank
J - Estimated
K -Biased high
L - Biased low
JB - Estimated, not detected above blank

R - Unreliable
U - Not detected
UJ - Not detected, Estimated
UL - Not detected, biased low

Table 4-3
Detected Compounds in Subsurface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28MM23	IS28MM28	IS28MM42	IS28SO04	IS28SO08	IS28SO09	IS28SO10	IS28SO12	IS28SO13		IS28SO15
Sample ID	IS28SB23-0103	IS28SB28-0103	IS28SB42-0103	IS28SB04-0103	IS28SB08-0103	IS28SB09-0103	IS28SB10-0103	IS28SB12-0103	IS28SB13-0105	IS28SB13-0105P	IS28SB15-0103
Sample Date	05/15/03	05/20/03	05/14/03	05/20/03	05/13/03	05/12/03	05/13/03	05/20/03	05/13/03	05/13/03	05/13/03
Chemical Name											
Volatile Organic Compounds (UG/KG)											
1,2-Dichloroethene (total)	NA	12 U	NA	11 UJ	NA	NA	NA	14 U	NA	NA	NA
2-Butanone	15 U	12 U	12 U	11 UJ	12 U	11 U	11 U	14 U	12 U	12 U	11 U
Acetone	43 B	1 B	12 U	2 B	31	11 U	11 U	7 B	12 U	12 U	11 U
Ethylbenzene	15 U	12 U	12 U	11 UJ	12 U	11 U	11 U	14 U	12 U	12 U	11 U
Methyl acetate	15 U	12 U	12 U	11 UJ	12 U	11 U	11 U	14 U	12 U	12 U	11 U
Methyl-tert-butyl ether (MTBE)	15 U	2 J	12 U	11 UJ	1 J	11 U	11 U	5 J	0.9 J	0.5 J	11 U
Methylene chloride	1 B	11 B	12 U	7 B	1 J	11 U	1 B	15 B	12 U	12 U	0.9 B
Trichloroethene	15 U	12 U	12 U	11 UJ	12 U	11 U	11 U	14 U	12 U	12 U	11 U
cis-1,2-Dichloroethene	15 U	12 U	12 U	11 UJ	12 U	11 U	11 U	14 U	12 U	12 U	11 U
Semi-volatile Organic Compounds (UG/KG)											
2,4-Dinitrotoluene	460 U	420 U	400 U	370 U	390 U	350 U	400	450 U	460 U	450 U	380 U
2-Methylnaphthalene	460 U	420 U	32 J	370 U	390 U	350 U	370 U	450 U	460 U	450 U	380 U
Acenaphthene	36 J	420 U	27 J	370 U	390 U	350 U	370 U	450 U	460 U	450 U	380 U
Acenaphthylene	32 J	420 U	78 J	370 U	390 U	350 U	370 U	450 U	460 U	450 U	380 U
Anthracene	97 J	420 U	100 J	370 U	390 U	350 U	26 J	450 U	460 U	450 U	380 U
Benzaldehyde	32 J	420 U	400 U	370 U	390 U	350 U	370 U	450 U	460 U	450 U	380 U
Benzo(a)anthracene	340 J	420 U	410	370 U	390 U	350 U	110 J	450 U	460 U	450 U	380 U
Benzo(a)pyrene	330 J	420 U	430	370 U	390 U	350 U	130 J	450 U	460 U	450 U	30 J
Benzo(b)fluoranthene	480	420 U	540	370 U	390 U	350 U	250 J	450 U	460 U	450 U	380 U
Benzo(g,h,i)perylene	99 J	420 U	370 J	370 U	390 U	350 U	370 U	450 U	460 U	450 U	44 J
Benzo(k)fluoranthene	190 J	420 U	210 J	370 U	390 U	350 U	100 J	450 U	460 U	450 U	380 U
Butylbenzylphthalate	460 U	420 U	75 J	370 U	390 U	350 U	370 U	450 U	460 U	450 U	380 U
Carbazole	78 J	420 U	27 J	370 U	390 U	350 U	370 U	450 U	460 U	450 U	380 U
Chrysene	440 J	420 U	470	370 U	390 U	350 U	140 J	450 U	460 U	450 U	380 U
Di-n-butylphthalate	85 B	30 J	95 B	19 J	390 U	42 B	380	24 J	460 U	450 U	380 U
Dibenz(a,h)anthracene	68 J	420 U	97 J	370 U	390 U	350 U	370 U	450 U	460 U	450 U	380 U
Dibenzofuran	38 J	420 U	22 J	370 U	390 U	350 U	370 U	450 U	460 U	450 U	380 U
Diethylphthalate	34 J	420 U	400 U	370 U	390 U	350 U	75 J	450 U	460 U	450 U	380 U
Fluoranthene	770	420 U	670	370 U	390 U	350 U	170 J	450 U	460 U	450 U	380 U
Fluorene	58 J	420 U	68 J	370 U	390 U	350 U	370 U	450 U	460 U	450 U	380 U
Indeno(1,2,3-cd)pyrene	250 J	420 U	400	370 U	390 U	350 U	130 J	450 U	460 U	450 U	380 U
Naphthalene	35 J	420 U	25 J	370 U	390 U	350 U	370 U	450 U	460 U	450 U	380 U
Phenanthrene	510	420 U	560	370 U	390 U	350 U	92 J	450 U	460 U	450 U	380 U
Phenol	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U	460 U	450 U	380 U
Pyrene	650	420 U	740	370 U	390 U	350 U	150 J	450 U	460 U	450 U	380 U
bis(2-Ethylhexyl)phthalate	460 U	68 B	58 J	36 B	390 U	350 U	110 B	120 B	460 U	450 U	64 B
n-Nitrosodiphenylamine	26 J	420 U	72 J	370 U	390 U	350 U	110 J	450 U	460 U	450 U	380 U
Explosives (UG/KG)											
1,3,5-Trinitrobenzene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	390
1,3-Dinitrobenzene	100 UL	100 U	100 U	100 U	63 J	100 U	100 U	100 U	100 U	100 U	100 U
2,4,6-Trinitrotoluene	100 UL	100 U	76 L	100 U	100 UL	100 UL	100 UL	41 J	100 UL	280 L	100 UL

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UL - Not detected, biased low

Table 4-3
Detected Compounds in Subsurface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28MM23	IS28MM28	IS28MM42	IS28SO04	IS28SO08	IS28SO09	IS28SO10	IS28SO12	IS28SO13		IS28SO15
Sample ID	IS28SB23-0103	IS28SB28-0103	IS28SB42-0103	IS28SB04-0103	IS28SB08-0103	IS28SB09-0103	IS28SB10-0103	IS28SB12-0103	IS28SB13-0105	IS28SB13-0105P	IS28SB15-0103
Sample Date	05/15/03	05/20/03	05/14/03	05/20/03	05/13/03	05/12/03	05/13/03	05/20/03	05/13/03	05/13/03	05/13/03
Chemical Name											
2,4-Dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	67 J	100 U
Nitrobenzene	100 UL	100 U	100 UL	100 U	100 U	79 L	100 U	80 J	190	100 U	150
Tetryl	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U	130 J	200 U
Total Metals (MG/KG)											
Aluminum	3,570	7,860 J	6,560	6,980 J	3,310	3,960	3,920	10,400 J	4,890	5,410	2,100
Antimony	0.25 U	0.3 B	0.27 R	0.24 R	0.21 R	0.19 R	0.2 R	0.33 R	0.22 R	0.24 R	0.21 R
Arsenic	324	3.2 L	23.3 L	9.1 L	1 J	1.7 B	13.7 L	1 J	0.91 J	0.76 J	0.28 UL
Barium	45.3	27.1 J	59.9	19.6 J	17.3 J	12.8 J	127	51.6	13.4 J	14.7 J	22 J
Beryllium	0.65 B	0.26 B	0.16 B	0.06 U	0.06 B	0.09 B	0.19 B	1.4 K	0.1 B	0.08 B	0.07 B
Cadmium	10	0.06 U	13.6	0.05 U	0.59 U	0.52 U	65.1	0.07 U	1.2 B	0.68 B	0.58 U
Calcium	549 J	70.1 J	1,730	168 J	369 J	48.7 J	1,350	913 J	280 J	246 J	268 J
Chromium	9.9	8 J	22.8	8.2 J	5.3	5	23.9	18.6 J	3.5	4.4	2.6 K
Cobalt	7.1 J	3.1 J	7.9 J	0.99 J	0.86 B	0.76 J	3.1 J	2.4 J	1.5 B	2.1 J	0.79 B
Copper	26.6	8.1 K	51.7	3 J	2.3 J	2.5 B	125	56.6	3.3 J	3 J	9.4
Iron	36,200	7,940	15,300	1,600	5,710	4,410	16,200	53,000	4,670	4,850	1,330
Lead	1,020	7.4 K	410	5.5 K	6 J	3.7	1,640 J	9.8 K	3.4	5.3	28.2 J
Magnesium	262 J	374 J	2,880	288 J	247 J	247 J	467 J	1,150 J	320 J	331 J	172 J
Manganese	303	10.6 J	110	8.4 J	5.6 J	15.7	157 J	12.1 J	10.6	12.4	36.7 J
Mercury	0.07 B	0.07 B	0.24 B	0.05 B	0.02 B	0.05 B	0.1 B	0.06 B	0.13 B	0.11 B	0.04 B
Nickel	8.4 B	5.2 J	91.9	3.6 J	1.89 U	1.67 U	9.8 K	5.6 J	2.2 J	3.4 J	1.84 U
Potassium	201 B	443 J	272 J	392 J	317 J	235 J	275 J	255 J	272 J	266 J	122 J
Selenium	0.6 B	0.56 B	0.42 U	0.38 U	0.35 J	0.3 U	0.32 U	0.52 U	0.35 U	0.38 U	0.33 U
Silver	0.88 U	0.94 U	1.6 J	0.87 U	1.2 J	1.2 B	0.83 J	1.19 U	0.79 U	0.86 U	0.75 U
Sodium	52.4 B	33.8 B	64.1 B	34.3 B	41.8 B	60.3 B	32.2 B	164 J	29.3 B	19.4 B	22.6 B
Thallium	0.55 U	0.59 UL	0.6 U	0.54 UL	0.48 U	0.42 U	0.45 U	0.74 UL	0.49 U	0.63 B	0.53 B
Vanadium	13.7 K	24.9 J	21.8	10.9 J	13.9 K	10.3 K	12 K	92.5 J	16 K	16.8 K	5.2 J
Zinc	4,170	48	6,090	21	36.3 L	12.2	33,900 L	61.4	108	128	96.9 L
Wet Chemistry (MG/KG)											
% Solids	71	79	85	85	84	91	91	72	83	72	89

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UL - Not detected, biased low

Table 4-3
Detected Compounds in Subsurface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28SO17	IS28SO18	IS28SO19	IS28SO21		IS28SO22	IS28SO24	IS28SO26	IS28SO27	IS28SO29	IS28SO32
Sample ID	IS28SB17-0103	IS28SB18-0103	IS28SB19-0105	IS28SB21-0103P	IS28SB21-0103	IS28SB22-0103	IS28SB24-0103	IS28SB26-0103	IS28SB27-0103	IS28SB29-0103	IS28SB32-0103
Sample Date	05/12/03	05/13/03	05/13/03	05/19/03	05/19/03	05/14/03	05/14/03	05/19/03	05/16/03	05/19/03	05/19/03
Chemical Name											
Volatile Organic Compounds (UG/KG)											
1,2-Dichloroethene (total)	NA	NA	NA	1 B	10 U	NA	NA	1 B	NA	1 B	2 J
2-Butanone	11 U	14 U	18 U	10 U	10 U	13 U	12 U	4 J	13 U	12 U	13 UJ
Acetone	11 U	46 B	18 U	10 B	7 B	13 U	12 U	16 B	13 U	9 B	34 B
Ethylbenzene	11 U	14 U	18 U	10 U	10 U	13 U	12 U	10 U	13 U	12 U	2 J
Methyl acetate	11 U	14 U	18 U	10 U	10 U	13 U	12 U	10 U	13 U	12 U	6 J
Methyl-tert-butyl ether (MTBE)	0.6 J	14 U	18 U	2 J	2 J	0.7 J	12 U	2 J	13 U	12 U	4 J
Methylene chloride	11 U	2 B	3 B	7 B	9 B	13 U	12 U	10 B	13 U	10 B	33 B
Trichloroethene	11 U	14 U	18 U	10 U	10 U	13 U	12 U	10 U	13 U	12 UL	13 UJ
cis-1,2-Dichloroethene	11 U	14 U	18 U	1 B	10 U	13 U	12 U	1 B	13 U	1 B	2 J
Semi-volatile Organic Compounds (UG/KG)											
2,4-Dinitrotoluene	370 U	410 U	640 U	390 U	380 U	430 U	390 U	410 U	400 U	410 U	430 U
2-Methylnaphthalene	370 U	410 U	640 U	390 U	380 U	430 U	390 U	410 U	400 U	410 U	430 U
Acenaphthene	370 U	410 U	640 U	390 U	380 U	430 U	390 U	410 U	400 U	410 U	430 U
Acenaphthylene	370 U	410 U	640 U	390 U	380 U	430 U	390 U	410 U	400 U	410 U	430 U
Anthracene	370 U	410 U	640 U	390 U	380 U	430 U	390 U	410 U	400 U	410 U	430 U
Benzaldehyde	370 U	410 U	60 J	390 U	380 U	430 U	390 U	410 U	400 U	410 U	430 U
Benzo(a)anthracene	39 J	52 J	640 U	390 U	380 U	430 U	390 U	410 U	400 U	410 U	22 J
Benzo(a)pyrene	36 J	47 J	640 U	390 U	380 U	430 U	390 U	410 U	400 U	410 U	430 U
Benzo(b)fluoranthene	61 J	120 J	640 U	390 U	380 U	430 U	390 U	410 U	400 U	410 U	23 J
Benzo(g,h,i)perylene	39 J	36 J	640 U	390 U	380 U	430 U	390 U	410 U	400 U	410 U	430 U
Benzo(k)fluoranthene	370 U	56 J	640 U	390 U	380 U	430 U	390 U	410 U	400 U	410 U	430 U
Butylbenzylphthalate	370 U	410 U	640 U	390 U	380 U	52 J	390 U	410 U	400 U	410 U	430 U
Carbazole	370 U	410 U	640 U	390 U	380 U	430 U	390 U	410 U	400 U	410 U	430 U
Chrysene	46 J	74 J	640 U	390 U	380 U	430 U	390 U	410 U	400 U	410 U	35 J
Di-n-butylphthalate	63 B	22 B	74 B	390 U	35 J	640	390 U	33 J	400 U	26 J	28 J
Dibenz(a,h)anthracene	370 U	410 U	640 U	390 U	380 U	430 U	390 U	410 U	400 U	410 U	430 U
Dibenzofuran	370 U	410 U	640 U	390 U	380 U	430 U	390 U	410 U	400 U	410 U	430 U
Diethylphthalate	370 U	410 U	640 U	390 U	380 U	40 J	390 U	410 U	400 U	410 U	430 U
Fluoranthene	69 J	83 J	47 J	390 U	380 U	430 U	390 U	410 U	400 U	410 U	430 U
Fluorene	370 U	410 U	640 U	390 U	380 U	430 U	390 U	410 U	400 U	410 U	430 U
Indeno(1,2,3-cd)pyrene	36 J	49 J	640 U	390 U	380 U	430 U	390 U	410 U	400 U	410 U	430 U
Naphthalene	370 U	410 U	640 U	390 U	380 U	430 U	390 U	410 U	400 U	410 U	430 U
Phenanthrene	21 J	25 J	39 J	390 U	380 U	430 U	390 U	410 U	400 U	410 U	430 U
Phenol	370 U	410 U	640 U	390 U	380 U	430 U	390 U	410 U	400 U	410 U	32 J
Pyrene	67 J	84 J	37 J	390 U	380 U	430 U	390 U	410 U	400 U	410 U	45 B
bis(2-Ethylhexyl)phthalate	370 U	69 J	640 U	54 B	52 B	430 U	390 U	61 B	61 J	410 U	430 U
n-Nitrosodiphenylamine	370 U	130 J	2,000	390 U	380 U	430 U	390 U	410 U	400 U	410 U	
Explosives (UG/KG)											
1,3,5-Trinitrobenzene	100 U	100 U	100 UL	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 UL
1,3-Dinitrobenzene	100 U	100 U	100 UL	100 U	100 U	100 U	100 U	100 U	100 UL	100 U	100 U
2,4,6-Trinitrotoluene	100 UL	100 UL	100 UL	59 J	100 U	110 L	100 UL	100 U	100 UL	100 U	100 U

B - Not detected above blank
J - Estimated
K -Biased high
L - Biased low
JB - Estimated, not detected above blank

R - Unreliable
U - Not detected
UJ - Not detected, Estimated
UL - Not detected, biased low

Table 4-3
Detected Compounds in Subsurface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28SO17	IS28SO18	IS28SO19	IS28SO21		IS28SO22	IS28SO24	IS28SO26	IS28SO27	IS28SO29	IS28SO32
Sample ID	IS28SB17-0103	IS28SB18-0103	IS28SB19-0105	IS28SB21-0103P	IS28SB21-0103	IS28SB22-0103	IS28SB24-0103	IS28SB26-0103	IS28SB27-0103	IS28SB29-0103	IS28SB32-0103
Sample Date	05/12/03	05/13/03	05/13/03	05/19/03	05/19/03	05/14/03	05/14/03	05/19/03	05/16/03	05/19/03	05/19/03
Chemical Name											
2,4-Dinitrotoluene	100 U	100 U	100 UL	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Nitrobenzene	100 UL	100 U	260 L	100 U	100 U	100 UL	100 UL	100 U	100 UL	100 U	100 U
Tetryl	200 U	200 U	200 UL	200 U	200 U	54 J	200 U	200 U	200 U	200 U	200 UL
Total Metals (MG/KG)											
Aluminum	3,420	1,040	8,920	6,460 J	2,080 J	8,670	4,380	2,340 J	4,170	3,080 J	4,290
Antimony	0.24 R	0.19 R	101 L	0.27 R	0.22 R	0.31 R	0.19 R	0.27 R	0.29 U	0.44 B	0.27 R
Arsenic	7.8	8.9 L	37.2 L	5 L	16.6 L	2.6 K	6.4 L	10 L	36	2.8 L	3.9 L
Barium	25.9 J	29.8	3,670	26.1 J	27.3 J	33.2 J	15.8 J	25.1 J	34.7 J	21.1 J	35.9 J
Beryllium	0.14 B	0.09 B	0.29 B	0.19 B	0.05 U	0.44 B	0.14 B	0.11 B	0.45 B	0.2 B	0.35 B
Cadmium	14.6	4.8	125	0.74 U	0.61 U	0.85 U	0.53 U	5.1	0.79 U	0.06 U	0.73 U
Calcium	567 J	92.2 J	22,400	379 J	220 J	76.9 J	50.1 J	502 J	205 J	157 J	272 J
Chromium	10.7	2.1 B	176	11.2 J	3.3 J	9	7.6	6 J	4.8	4.2 J	7.7 J
Cobalt	1.6 J	0.55 B	19.2 J	1 J	0.74 B	7.1 J	0.77 B	2.3 J	3.6 J	1.7 J	3.1 J
Copper	16.1	18.2	2,300	6.8 K	2.5 B	11.4	5	17	7.5 K	3.6 J	11.8
Iron	8,360	2,150	130,000	16,200	1,600	12,100	13,200	8,830	5,480	2,860	11,700
Lead	152	149	16,600 J	8.6 K	6.7 K	6.6	5.1	132 K	8.2	5.8 K	12
Magnesium	295 J	95.1 J	23,300	450 J	197 J	1,170 J	235 J	351 J	411 J	211 J	369 J
Manganese	52.5	13.5	1,060 J	8.4 J	8.2 J	35.6	4.2 K	69.9 J	36	21.9 J	62.2
Mercury	0.13 K	0.12 B	0.36	0.05 B	0.06 B	0.03 B	0.01 U	0.11 B	0.01 U	0.03 B	0.29
Nickel	5.7 J	2.3 J	251	2.35 U	1.94 U	6.3 J	3.5 J	3.8 J	5.2 B	2.33 U	4 J
Potassium	230 J	88.7 J	6,140	652 J	250 J	1,080 J	361 J	356 J	276 B	323 J	471 J
Selenium	0.66 B	0.31 U	1.18 U	0.42 B	0.35 U	0.49 U	0.47 J	0.43 U	0.46 U	0.42 U	0.52 J
Silver	1.1 B	0.7 U	6.7 K	0.96 U	0.79 U	1.11 U	1.1 J	0.98 U	1.04 U	0.95 U	0.96 U
Sodium	20 B	21.9 B	326 B	55.2 B	21.1 B	39.2 B	23.1 B	21.4 B	43.6 B	37.6 B	61.6 J
Thallium	0.55 U	0.44 U	1.68 U	0.73 B	0.49 UL	0.87 J	0.43 U	0.86 B	0.65 U	0.59 UL	0.6 U
Vanadium	10.7 K	3 J	28.8 K	29.1 J	3.8 J	24.5	20.1	14 J	14.2 K	10.8 J	19.2 K
Zinc	4,660	2,740	51,100 L	23.9	104	42.9	20.7	4,670	74.2	23.4	18.1
Wet Chemistry (MG/KG)											
% Solids	82	77	80	78	82	60	85	88	74	79	66

B - Not detected above blank
J - Estimated
K -Biased high
L - Biased low
JB - Estimated, not detected above blank

R - Unreliable
U - Not detected
UJ - Not detected, Estimated
UL - Not detected, biased low

Table 4-3
Detected Compounds in Subsurface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28SO33		IS28SO35	IS28SO36	IS28SO37	IS28SO38	IS28SO40	IS28SO41
Sample ID	IS28SB33-0103	IS28SB33-0103P	IS28SB35-0103	IS28SB36-0103	IS28SB37-0103	IS28SB38-0103	IS28SB40-0103	IS28SB41-0103
Sample Date	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03
Chemical Name								
Volatile Organic Compounds (UG/KG)								
1,2-Dichloroethene (total)	2 B	2 B	2 J	2 B	2 B	5 B	2 L	3 B
2-Butanone	12 U	13 U	15 U	13 U	17 UL	9 J	13 UL	13 UL
Acetone	8 B	8 B	10 B	7 B	4 B	42 B	9 B	17 B
Ethylbenzene	12 U	13 U	15 U	13 U	17 UL	26 U	13 UL	13 UL
Methyl acetate	12 U	13 U	15 U	13 U	17 UL	26 U	13 UL	13 UL
Methyl-tert-butyl ether (MTBE)	2 J	4 J	3 J	3 J	17 UL	5 J	2 L	3 L
Methylene chloride	9 B	10 B	21 B	10 B	11 B	21 B	24 B	17 B
Trichloroethene	12 U	13 U	15 U	13 U	17 UL	26 U	13 UL	2 B
cis-1,2-Dichloroethene	2 B	2 B	2 J	2 B	2 B	5 B	2 L	3 B
Semi-volatile Organic Compounds (UG/KG)								
2,4-Dinitrotoluene	400 U	400 U	500 U	410 U	530 U	960 U	440 U	440 U
2-Methylnaphthalene	400 U	400 U	500 U	410 U	530 U	960 U	440 U	440 U
Acenaphthene	400 U	400 U	500 U	410 U	530 U	960 U	440 U	440 U
Acenaphthylene	400 U	400 U	500 U	410 U	530 U	960 U	440 U	440 U
Anthracene	400 U	400 U	500 U	410 U	530 U	960 U	440 U	440 U
Benzaldehyde	400 U	400 U	500 U	410 U	530 U	960 U	440 U	440 U
Benzo(a)anthracene	400 U	400 U	500 U	410 U	530 U	960 U	440 U	26 J
Benzo(a)pyrene	400 U	400 U	500 U	410 U	530 U	960 U	440 U	440 U
Benzo(b)fluoranthene	400 U	400 U	500 U	410 U	530 U	960 U	440 U	440 U
Benzo(g,h,i)perylene	400 U	400 U	500 U	410 U	530 U	960 U	440 U	440 U
Benzo(k)fluoranthene	400 U	400 U	500 U	410 U	530 U	960 U	440 U	440 U
Butylbenzylphthalate	400 U	400 U	500 U	410 U	530 U	960 U	440 U	440 U
Carbazole	400 U	400 U	500 U	410 U	530 U	960 U	440 U	440 U
Chrysene	400 U	400 U	500 U	410 U	530 U	960 U	440 U	440 U
Di-n-butylphthalate	39 J	30 J	40 J	410 U	530 U	960 U	440 U	55 J
Dibenz(a,h)anthracene	400 U	400 U	500 U	410 U	530 U	960 U	440 U	440 U
Dibenzofuran	400 U	400 U	500 U	410 U	530 U	960 U	440 U	440 U
Diethylphthalate	400 U	400 U	500 U	410 U	530 U	960 U	440 U	440 U
Fluoranthene	400 U	400 U	500 U	410 U	530 U	960 U	440 U	440 U
Fluorene	400 U	400 U	500 U	410 U	530 U	960 U	440 U	440 U
Indeno(1,2,3-cd)pyrene	400 U	400 U	500 U	410 U	530 U	960 U	440 U	440 U
Naphthalene	400 U	400 U	500 U	410 U	530 U	960 U	440 U	440 U
Phenanthrene	400 U	400 U	500 U	410 U	530 U	960 U	440 U	440 U
Phenol	400 U	400 U	500 U	410 U	530 U	960 U	440 U	440 U
Pyrene	400 U	400 U	500 U	410 U	530 U	960 U	440 U	440 U
bis(2-Ethylhexyl)phthalate	400 U	47 B	72 B	44 B	120 B	110 B	440 U	440 U
n-Nitrosodiphenylamine	400 U	400 U	500 U	410 U	530 U	960 U	440 U	440 U
Explosives (UG/KG)								
1,3,5-Trinitrobenzene	100 UL	100 UL	100 UL	100 UL	100 UL	100 UL	100 UL	100 UL
1,3-Dinitrobenzene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2,4,6-Trinitrotoluene	43 J	100 U	120	100 U	100 U	100 U	100 U	100 U

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J - Estimated
K -Biased high
L - Biased low
JB - Estimated, not detected above blank

R - Unreliable
U - Not detected
UJ - Not detected, Estimated
UL - Not detected, biased low

Table 4-3
Detected Compounds in Subsurface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28SO33		IS28SO35	IS28SO36	IS28SO37	IS28SO38	IS28SO40	IS28SO41
Sample ID	IS28SB33-0103	IS28SB33-0103P	IS28SB35-0103	IS28SB36-0103	IS28SB37-0103	IS28SB38-0103	IS28SB40-0103	IS28SB41-0103
Sample Date	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03
Chemical Name								
2,4-Dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Nitrobenzene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
Tetryl	200 UL	200 UL	200 UL	200 UL	200 UL	200 UL	200 UL	200 UL
Total Metals (MG/KG)								
Aluminum	1,510	1,660	2,640	1,850	10,700	7,250	7,490	10,100
Antimony	0.25 R	0.33 B	0.3 R	0.29 R	0.32 R	0.69 R	0.32 R	0.31 R
Arsenic	1.7 J	1.7 J	1.1 J	1.6 J	1.4 J	5.2 L	1.1 J	3.9 L
Barium	13.2 J	13.8 J	25.1 J	14.5 J	50.2	81.2 J	62.8	57.1
Beryllium	0.14 B	0.13 B	0.66 B	0.25 B	0.55 B	0.96 B	1.4 K	0.71 J
Cadmium	0.68 U	0.77 U	0.81 U	0.8 U	0.88 U	1.9 U	0.88 U	0.87 U
Calcium	112 J	116 J	596 J	99.3 J	170 J	1,140 J	1,880	496 J
Chromium	2.9 J	2.5 J	6.7 J	1.6 J	11 J	11.8 J	21.8 J	14.4 J
Cobalt	2.6 J	2.2 J	8 J	12.4 K	6.2 J	15.7 J	18.1 K	8.4 J
Copper	3.2 J	3.4 J	14.8	3.2 J	10.6 K	15.1 K	36.6	19.7
Iron	1,280	1,400	15,000	1,560	10,800	9,930	31,900	16,800
Lead	5.9	5	5.4	3.6	9.2	15	11.6	11.2
Magnesium	125 J	132 J	686 J	238 J	686 J	668 J	1,840	841 J
Manganese	10.9	11.1	41.8	31.6	35.4	77.5	71.6	51.2
Mercury	0.01 U	0.03 B	0.02 U	0.02 U	0.11 B	0.16 B	0.03 B	0.17
Nickel	2.5 J	2.47 U	4.5 J	4.5 J	7.8 J	16.4 J	13.4 K	11.5 K
Potassium	265 J	242 J	544 J	300 J	736 J	719 J	994 J	897 J
Selenium	0.39 U	0.44 U	0.47 U	0.46 U	0.51 U	1.09 U	0.5 U	0.5 U
Silver	0.89 U	1.01 U	1.06 U	1.05 U	1.15 U	2.48 U	1.14 U	1.13 U
Sodium	31.6 B	29.5 B	52.6 B	27.1 B	35.1 B	106 J	115 J	73.1 J
Thallium	0.56 U	0.63 U	0.98 B	0.65 B	0.88 B	1.6 B	1.3 B	0.99 B
Vanadium	7.8 J	7.4 J	29.3	4.4 J	27.6	27.1 K	83.8	32.1
Zinc	7.3 K	7.4 K	19.1	15.9	38.5	127	67.2	48.2
Wet Chemistry (MG/KG)								
% Solids	79	82	70	66	72	80	79	73

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J - Estimated
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L - Biased low
JB - Estimated, not detected above blank

R - Unreliable
U - Not detected
UJ - Not detected, Estimated
UL - Not detected, biased low

Table 4-4
Detected Compounds in Background Subsurface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28MM01	IS28MM16	IS28SO34	IS28SO39	
Sample ID	IS28SB01-0103	IS28SB16-0103	IS28SB34-0103	IS28SB39-0103	IS28SB39-0103P
Sample Date	05/15/03	05/14/03	05/16/03	05/16/03	05/16/03
Chemical Name					
Semi-volatile Organic Compounds (UG/KG)					
Acenaphthylene	400 U	370 U	460 U	43 J	24 J
Anthracene	400 U	370 U	460 U	37 J	25 J
Benzaldehyde	400 U	370 U	460 U	34 J	33 J
Benzo(a)anthracene	400 U	370 U	460 U	220 J	160 J
Benzo(a)pyrene	400 U	370 U	460 U	210 J	140 J
Benzo(b)fluoranthene	400 U	370 U	460 U	310 J	210 J
Benzo(k)fluoranthene	400 U	370 U	460 U	140 J	80 J
Chrysene	400 U	370 U	460 U	330 J	180 J
Dibenz(a,h)anthracene	400 U	370 U	460 U	40 J	27 J
Fluoranthene	400 U	370 U	460 U	460	250 J
Indeno(1,2,3-cd)pyrene	400 U	370 U	460 U	170 J	96 J
Phenanthrene	400 U	370 U	460 U	180 J	85 J
Phenol	400 U	370 U	460 U	420 U	24 J
Pyrene	400 U	19 J	460 U	500	280 J
bis(2-Ethylhexyl)phthalate	400 U	370 U	460 U	140 J	460 U
Explosives (UG/KG)					
2,4,6-Trinitrotoluene	57 L	100 UL	100 UL	100 UL	100 UL
Nitrobenzene	130 L	100 UL	100 UL	100 UL	100 UL
Total Metals (MG/KG)					
Aluminum	14,100	6,150	4,480	6,730	7,630
Arsenic	5.2	7.7 L	349	44.8	15.3
Barium	39.8	51.6	70.6	45.7	47.5
Beryllium	0.3 B	0.33 B	2.8 B	0.46 B	0.52 J
Cadmium	0.69 U	1.1 B	1.1 K	0.74 U	0.78 U
Calcium	278 J	369 J	1,660	236 J	276 J
Chromium	16.7	11.2	6.8	13.2	14.2
Cobalt	4.3 J	7.1 J	44.7	9.3 J	5.3 J
Copper	8.9 K	6	17	29.9	10.7
Iron	20,000	10,200	17,900	28,500	17,800
Lead	10	30.9	19.2	315	16.8
Magnesium	1,030	546 J	972	550 J	592 J

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J - Estimated
K -Biased high
L - Biased low
JB - Estimated, not detected above blank

R - Unreliable
U - Not detected
UJ - Not detected, Estimated
UL - Not detected, biased low

Table 4-4
Detected Compounds in Background Subsurface Soil Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28MM01	IS28MM16	IS28SO34	IS28SO39	
Sample ID	IS28SB01-0103	IS28SB16-0103	IS28SB34-0103	IS28SB39-0103	IS28SB39-0103P
Sample Date	05/15/03	05/14/03	05/16/03	05/16/03	05/16/03
Chemical Name					
Manganese	107	403	660	52.6	60.2
Nickel	7.8 B	3.9 J	16.4 B	21	6.9 J
Potassium	534 B	263 J	546 B	454 B	598 J
Selenium	0.39 U	0.46 J	0.41 U	0.54 B	0.45 U
Vanadium	31.1	15 K	24.4	25.2	28.2
Zinc	36.3	490	390	117	59.1
Wet Chemistry (MG/KG)					
% Solids	82	83	73	78	67

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J - Estimated
K -Biased high
L - Biased low
JB - Estimated not detected above blank

R - Unreliable
U - Not detected
UJ - Not detected, Estimated
UL - Not detected biased low

Table 4-5
Detected Compounds in Sediment Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28SWSD01	IS28SWSD02		IS28SWSD03	IS28SD01		IS28SD02	
Sample ID	IS28SD01-0503	IS28SD02-0503	IS28SD02-0503P	IS28SD03-0503	IS28SD010006	IS28SD010612	IS28SD020006	IS28SD020612
Sample Date	05/21/03	05/21/03	05/21/03	05/20/03	05/12/03	05/12/03	05/12/03	05/12/03
Chemical Name								
Volatile Organic Compounds (UG/KG)								
1,2-Dichloroethene (total)	2 J	3 J	1 L	2 B	NA	NA	NA	NA
Acetone	13 B	34 UJ	12 UJ	3 J	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	14 U	34 U	12 UL	5 L	NA	NA	NA	NA
cis-1,2-Dichloroethene	2 J	3 J	1 L	2 B	NA	NA	NA	NA
Semi-volatile Organic Compounds (UG/KG)								
2,4-Dinitrotoluene	450 U	820 J	520 U	580 U	NA	NA	460 U	430 U
Benzaldehyde	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
Benzo(a)anthracene	450 U	140 J	520 U	140 J	NA	NA	460 U	430 U
Benzo(a)pyrene	450 U	130 J	520 U	83 J	NA	NA	460 U	430 U
Benzo(b)fluoranthene	49 J	250 J	520 U	140 J	NA	NA	460 U	430 U
Benzo(g,h,i)perylene	450 U	1,200 U	520 U	36 J	NA	NA	460 U	430 U
Benzo(k)fluoranthene	450 U	1,200 U	520 U	71 J	NA	NA	460 U	430 U
Butylbenzylphthalate	450 U	1,200 U	520 U	580 U	NA	NA	28 J	430 U
Chrysene	30 J	160 J	520 U	150 J	NA	NA	460 U	430 U
Di-n-butylphthalate	26 J	110 J	520 U	47 J	NA	NA	43 B	430 U
Diethylphthalate	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
Fluoranthene	37 J	220 J	520 U	200 J	NA	NA	460 U	430 U
Indeno(1,2,3-cd)pyrene	450 U	93 J	520 U	45 J	NA	NA	460 U	430 U
Phenanthrene	450 U	72 J	520 U	580 U	NA	NA	460 U	430 U
Pyrene	37 J	230 J	520 U	170 J	NA	NA	460 U	110 J
bis(2-Ethylhexyl)phthalate	33 B	180 B	520 U	84 B	NA	NA	65 B	47 J
n-Nitrosodiphenylamine	450 U	220 J	520 U	580 U	NA	NA	460 U	430 U
Explosives (UG/KG)								
2,4-Dinitrotoluene	100 U	130	100 U	100 U	NA	NA	100 U	100 U
2-Amino-4,6-dinitrotoluene	100 U	59 J	100 U	100 U	NA	NA	100 U	100 U
4-Amino-2,6-dinitrotoluene	100 U	110	100 U	100 U	NA	NA	100 U	100 U
Nitroglycerin	6,000 U	25,000 J	7,600 U	6,700 U	NA	NA	6,400 U	7,800 U
Total Metals (MG/KG)								
Aluminum	1,420 J	13,400 J	5,660 J	2,990 J	1,910	1,290	1,970	3,360
Antimony	0.3 UL	0.66 UL	0.33 UL	0.43 UL	0.31 UL	0.23 UL	0.29 UL	0.2 UL
Arsenic	13.3 J	220 J	58.1 J	80.4 J	0.96 B	0.67 B	11.4	5

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R - Unreliable
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UJ - Not detected, Estimated
UL - Not detected, biased low

Table 4-5
Detected Compounds in Sediment Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28SWSD01	IS28SWSD02		IS28SWSD03	IS28SD01		IS28SD02	
Sample ID	IS28SD01-0503	IS28SD02-0503	IS28SD02-0503P	IS28SD03-0503	IS28SD010006	IS28SD010612	IS28SD020006	IS28SD020612
Sample Date	05/21/03	05/21/03	05/21/03	05/20/03	05/12/03	05/12/03	05/12/03	05/12/03
Chemical Name								
Barium	24 J	166	75	31.1 J	17.9 J	13.5 J	16.6 J	22.9 J
Beryllium	0.27 B	0.91 B	0.3 B	0.38 B	0.15 J	0.13 J	0.26 J	0.23 J
Cadmium	4.2 J	25.3 J	28 J	12 J	0.85 U	0.63 U	0.81 U	0.56 U
Calcium	1,450	1,240 J	712 J	405 J	245 J	89.8 J	270 J	205 J
Chromium	15 J	18.3 J	8.2 J	5.2 J	3.4 K	5.9	9.6	5.3
Cobalt	6.5 J	11.7 J	4.8 J	4.6 J	3 J	3.9 J	2.2 J	4.7 J
Copper	38.8 J	111 J	41.3 J	67.5 J	2.8 B	1.7 B	3.8 J	3.4 J
Iron	8,960 J	31,900 J	8,740 J	6,880 J	1,850	1,370	3,830	2,610
Lead	76.8 J	827 J	278 J	437 J	7.6 K	3.7 K	20.7 K	5.6 K
Magnesium	1,160	1,080 J	459 J	267 J	224 J	135 J	239 J	272 J
Manganese	104 K	251 K	89.6 K	100 K	28.7	14.3	40.6	16
Mercury	0.12 B	0.48	0.38	0.05 B	0.04 B	0.02 B	0.05 B	0.04 B
Nickel	44.4 J	16 J	8.1 J	4.3 J	4.9 J	2 U	4.6 J	4.3 J
Potassium	114 U	614 J	280 J	253 J	166 J	87.7 U	114 J	212 J
Selenium	0.48 J	2 J	0.76 J	0.67 U	0.49 U	0.36 U	0.46 U	0.48 B
Silver	1.1 J	2.37 U	1.18 U	1.54 U	1.12 U	0.82 U	1.1 J	0.9 J
Thallium	0.66 U	1.48 U	0.73 U	0.96 U	1.4 B	0.65 B	0.66 U	0.74 B
Vanadium	5.3 B	39.3 K	10.5 J	10 J	7.5 J	5.6 J	7.9 J	9.6 K
Zinc	1,420 J	14,200 J	7,480 J	6,770 J	11.9	5.1 K	138	79.4
Wet Chemistry (MG/KG)								
% Solids	83	38	66	74	77	82	78	64
Total organic carbon (TOC)	12,000	82,000	31,000	32,000	NA	NA	8,100	6,000
pH	6.1	6.7	7.1	6.6	NA	NA	NA	NA

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JB - Estimated, not detected above blank

R - Unreliable
U - Not detected
UJ - Not detected, Estimated
UL - Not detected, biased low

Table 4-5
Detected Compounds in Sediment Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28SD03		IS28SD04				IS28SD05	
Sample ID	IS28SD030006	IS28SD030612	IS28SD40612	IS28SD40612P	IS28SD040006	IS28SD040006P	IS28SD050006	IS28SD050612
Sample Date	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03
Chemical Name								
Volatile Organic Compounds (UG/KG)								
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
Semi-volatile Organic Compounds (UG/KG)								
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/KG)								
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
Nitroglycerin	NA	NA	NA	NA	NA	NA	NA	NA
Total Metals (MG/KG)								
Aluminum	3,270 J	1,250 J	3,130 J	2,020 J	4,650 J	3,630 J	4,460 J	11,200 J
Antimony	0.29 UL	0.26 UL	0.31 UL	0.46 J	0.4 J	0.32 UL	0.33 UL	0.36 UL
Arsenic	14.8 J	7.8 J	27.4 J	11.3 J	15.5 J	16.5 J	36.7 J	22.5 J

B - Not detected above blank
J - Estimated
K -Biased high
L - Biased low
JB - Estimated, not detected above blank

R - Unreliable
U - Not detected
UJ - Not detected, Estimated
UL - Not detected, biased low

Table 4-5
Detected Compounds in Sediment Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28SD03		IS28SD04				IS28SD05	
Sample ID	IS28SD030006	IS28SD030612	IS28SD40612	IS28SD40612P	IS28SD040006	IS28SD040006P	IS28SD050006	IS28SD050612
Sample Date	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03
Chemical Name								
Barium	35.6 J	8.8 J	41.4 J	35.4 J	99.8	97.7	38.8 J	78.1
Beryllium	0.24 B	0.06 B	0.21 B	0.08 B	0.25 B	0.2 B	0.22 B	0.58 B
Cadmium	9.5 J	6 J	12.9 J	7.3 J	8.6 J	9.1 J	11.9 J	7.9 J
Calcium	468 J	112 B	596 J	352 J	589 J	598 J	503 J	839 J
Chromium	14.3 J	5.9 J	8.3 J	6.4 J	11.1 J	9.8 J	8.5 J	16.7 J
Cobalt	4.7 J	1.4 J	4.5 J	2.8 J	4 J	4.2 J	4.1 J	8.1 J
Copper	51.7 J	18.5 J	40.5 J	33.6 J	82.6 J	74.4 J	89.9 J	34.5 J
Iron	17,900 J	11,100 J	9,390 J	8,130 J	10,100 J	10,100 J	11,100 J	15,900 J
Lead	423 J	321 J	386 J	276 J	464 J	402 J	716 J	194 J
Magnesium	594 J	125 J	564 J	555 J	699 J	617 J	612 J	1,240 J
Manganese	351 K	26.4 K	61.2 K	53.3 K	118 K	121 K	168 K	171 K
Mercury	0.09 B	0.04 B	0.14 B	0.1 B	0.37	0.38	0.11 B	0.13 B
Nickel	16.2 J	2.8 J	8.4 J	8.8 J	7.6 J	8.9 J	6.5 J	11.2 J
Potassium	219 J	99.3 U	321 J	204 J	409 J	368 J	284 J	694 J
Selenium	0.82 J	0.41 U	0.5 J	0.9 J	0.8 J	0.62 J	0.85 J	0.72 J
Silver	1.04 U	0.93 U	1.11 U	1.07 U	1.21 U	1.16 U	1.2 U	1.4 J
Thallium	0.65 U	0.58 U	0.69 U	0.67 U	0.75 U	0.73 U	0.75 U	0.81 U
Vanadium	13.8 K	7.6 J	11.9 J	8.6 J	14 K	12.6 K	14.1 K	24.4
Zinc	8,190 J	4,440 J	6,490 J	4,580 J	4,640 J	4,670 J	10,700 J	4,500 J
Wet Chemistry (MG/KG)								
% Solids	66	84	71	69	69	71	62	64
Total organic carbon (TOC)	NA	NA	NA	NA	NA	NA	NA	NA
pH	NA	NA	NA	NA	NA	NA	NA	NA

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JB - Estimated, not detected above blank

R - Unreliable
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UL - Not detected, biased low

Table 4-5
Detected Compounds in Sediment Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28SD06		IS28SD07		IS28SD08	IS28SD09	
Sample ID	IS28SD060006	IS28SD060612	IS28SD070006	IS28SD070612	IS28SD080006	IS28SD090006	IS28SD090612
Sample Date	05/13/03	05/13/03	05/13/03	05/13/03	05/13/03	05/13/03	05/13/03
Chemical Name							
Volatile Organic Compounds (UG/KG)							
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA
Semi-volatile Organic Compounds (UG/KG)							
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	400 U	410 U
Benzaldehyde	NA	NA	NA	NA	NA	400 U	410 U
Benzo(a)anthracene	NA	NA	NA	NA	NA	400 U	410 U
Benzo(a)pyrene	NA	NA	NA	NA	NA	400 U	410 U
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	400 U	410 U
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	400 U	410 U
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	400 U	410 U
Butylbenzylphthalate	NA	NA	NA	NA	NA	400 U	410 U
Chrysene	NA	NA	NA	NA	NA	400 U	410 U
Di-n-butylphthalate	NA	NA	NA	NA	NA	400 U	410 U
Diethylphthalate	NA	NA	NA	NA	NA	37 J	410 U
Fluoranthene	NA	NA	NA	NA	NA	400 U	410 U
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	400 U	410 U
Phenanthrene	NA	NA	NA	NA	NA	400 U	410 U
Pyrene	NA	NA	NA	NA	NA	400 U	410 U
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	29 J	410 U
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	400 U	410 U
Explosives (UG/KG)							
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	100 U	100 U
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA	NA	100 U	100 U
4-Amino-2,6-dinitrotoluene	NA	NA	NA	NA	NA	100 U	100 U
Nitroglycerin	NA	NA	NA	NA	NA	5,700 U	6,200 U
Total Metals (MG/KG)							
Aluminum	4,940	9,170	3,450	7,410	1,120	3,860	5,030
Antimony	0.26 UL	0.29 UL	0.26 UL	0.31 UL	0.22 UL	0.27 UL	0.24 UL
Arsenic	2.2	5.2	1.2 B	3.3 K	1.3 B	1.6 B	1.6 B

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UL - Not detected, biased low

Table 4-5
Detected Compounds in Sediment Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28SD06		IS28SD07		IS28SD08	IS28SD09	
Sample ID	IS28SD060006	IS28SD060612	IS28SD070006	IS28SD070612	IS28SD080006	IS28SD090006	IS28SD090612
Sample Date	05/13/03	05/13/03	05/13/03	05/13/03	05/13/03	05/13/03	05/13/03
Chemical Name							
Barium	40.7	47.3	25.4 J	52.8	11.6 J	22 J	24.4 J
Beryllium	0.73 J	0.97 J	0.32 J	0.79 J	0.16 J	0.24 J	0.21 J
Cadmium	0.71 U	0.8 U	0.72 U	0.85 U	0.62 U	0.74 U	0.67 U
Calcium	1,450	835 J	778 J	812 J	307 J	470 J	498 J
Chromium	10.2	16.2	7	12	3.8	6.6	8.7
Cobalt	11.7 K	29.3	1.6 J	3 J	3.5 J	6.3 J	3.9 J
Copper	10.8	15.1	4.8 J	4.9 J	5.7 K	6.8 K	7.8 K
Iron	21,800	39,600	7,260	25,400	4,020	12,700	6,600
Lead	6.6 K	8.1 K	6 K	9.9 K	8.6 K	6.3 K	5.5 K
Magnesium	929 J	1,030 J	580 J	733 J	182 J	466 J	559 J
Manganese	284	192	57.1	63	68.1	351	26.3
Mercury	0.02 B	0.08 B	0.05 B	0.06 B	0.03 B	0.05 B	0.03 B
Nickel	5.9 J	11.1 K	2.4 J	5.1 J	3.6 J	4.1 J	2.6 J
Potassium	559 J	530 J	444 J	648 J	86.6 U	323 J	374 J
Selenium	0.41 U	0.46 U	0.62 B	0.49 U	0.35 U	0.43 U	0.61 B
Silver	1.8 J	2.4 K	0.99 J	2.2 J	1.1 J	1.4 J	0.92 J
Thallium	0.97 B	1.4 B	0.58 U	0.69 U	0.5 U	0.61 U	0.83 B
Vanadium	28.2	35.3	22.6	37.9	4.2 J	15.7 K	22
Zinc	26.4	31.3	8.3 K	13.6	48.8	17.8	10 K
Wet Chemistry (MG/KG)							
% Solids	65	74	73	69	86	88	81
Total organic carbon (TOC)	NA	NA	NA	NA	NA	2,200	1,000
pH	NA	NA	NA	NA	NA	NA	NA

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Table 4-5
Detected Compounds in Sediment Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28SD10		IS28SD11		IS28SD12		IS28SD13	
Sample ID	IS28SD100006	IS28SD100612	IS28SD110006	IS28SD110612	IS28SD120006	IS28SD120612	IS28SD130006	IS28SD130612
Sample Date	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03
Chemical Name								
Volatile Organic Compounds (UG/KG)								
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
Semi-volatile Organic Compounds (UG/KG)								
2,4-Dinitrotoluene	NA	NA	1,000 U	890 U	NA	NA	NA	NA
Benzaldehyde	NA	NA	160 J	160 J	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	1,000 U	100 J	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	1,000 U	100 J	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	70 J	84 J	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	1,000 U	80 J	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	1,000 U	890 U	NA	NA	NA	NA
Butylbenzylphthalate	NA	NA	1,000 U	63 J	NA	NA	NA	NA
Chrysene	NA	NA	67 J	890 U	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	52 B	65 B	NA	NA	NA	NA
Diethylphthalate	NA	NA	1,000 U	890 U	NA	NA	NA	NA
Fluoranthene	NA	NA	92 J	64 J	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	1,000 U	890 U	NA	NA	NA	NA
Phenanthrene	NA	NA	1,000 U	890 U	NA	NA	NA	NA
Pyrene	NA	NA	97 J	120 J	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	140 B	190 B	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	79 J	890 U	NA	NA	NA	NA
Explosives (UG/KG)								
2,4-Dinitrotoluene	NA	NA	100 U	100 U	NA	NA	NA	NA
2-Amino-4,6-dinitrotoluene	NA	NA	100 U	100 U	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	NA	NA	100 U	100 U	NA	NA	NA	NA
Nitroglycerin	NA	NA	14,000 U	15,000 U	NA	NA	NA	NA
Total Metals (MG/KG)								
Aluminum	2,940 J	3,370 J	11,700	10,500	18,400	16,600	14,200	14,900
Antimony	0.41 UL	0.34 UL	0.6 UL	0.6 UL	0.5 UL	0.43 UL	0.71 UL	0.39 UL
Arsenic	1.2 J	1.1 J	8.2 K	7.3 K	6.7 K	4 K	7.9 K	4.9 K

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Table 4-5
Detected Compounds in Sediment Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28SD10		IS28SD11		IS28SD12		IS28SD13	
Sample ID	IS28SD100006	IS28SD100612	IS28SD110006	IS28SD110612	IS28SD120006	IS28SD120612	IS28SD130006	IS28SD130612
Sample Date	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03
Chemical Name								
Barium	23 J	25.7 J	95.5	90.5	134	115	112	110
Beryllium	0.22 B	0.34 B	0.87 J	0.8 J	1 J	0.97 J	1 J	0.94 J
Cadmium	0.37 B	0.08 B	1.64 U	1.65 U	1.37 U	1.18 U	1.94 U	1.07 U
Calcium	770 J	873 J	2,060 J	1,840 J	1,770 J	1,290 J	2,050 J	1,530
Chromium	6.1 J	5.5 J	23	20.1	27.8	25.1	26	24.7
Cobalt	5.1 J	4.6 J	12.6 J	11.4 J	12.9 J	10.8 J	13.2 J	12.3 J
Copper	6.1 J	5.3 J	23.9	24.3	17.3 K	13.2 K	23 K	13.8 K
Iron	3,500 J	2,620 J	20,200	19,300	23,900	21,600	26,600	23,700
Lead	8.6 J	6 J	36.7 K	35.8 K	20.6 K	13.8 K	27.9 K	16 K
Magnesium	460 J	496 J	1,880 J	1,740 J	2,510	2,130	2,540 J	2,120
Manganese	61.4 K	34.3 K	397	412	478	238	891	481
Mercury	0.07 B	0.06 B	0.44 K	0.11 B	0.34 B	0.12 B	0.35 B	0.16 B
Nickel	4.5 J	3.9 J	20.2 K	20.5 K	20.9 K	17.2 K	17.6 J	18.5 K
Potassium	158 U	226 J	911 J	756 J	1,150 J	1,060 J	1,120 J	924 J
Selenium	0.85 J	0.64 J	1.5 B	0.95 U	0.85 B	0.68 U	1.11 U	0.62 U
Silver	1.48 U	1.23 U	4 J	3.8 J	2.4 J	1.8 J	3.3 J	2.7 J
Thallium	0.92 U	0.77 U	1.5 B	1.35 U	1.5 B	0.96 U	1.6 B	1.5 B
Vanadium	11.2 J	10.6 J	32.1 K	31.4 K	38.2	33.8	33.6 K	30.7
Zinc	39.7 J	15.2 B	159	116	82.5	48.6	117	63
Wet Chemistry (MG/KG)								
% Solids	51	66	35	33	37	53	31	46
Total organic carbon (TOC)	NA	NA	72,000	58,000	NA	NA	NA	NA
pH	NA	NA	NA	NA	NA	NA	NA	NA

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L - Biased low
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UL - Not detected biased low

Table 4-5
Detected Compounds in Sediment Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28SD14		IS28SD15	
Sample ID	IS28SD140006	IS28SD140612	IS28SD150006	IS28SD150612
Sample Date	05/14/03	05/14/03	05/14/03	05/14/03
Chemical Name				
Volatile Organic Compounds (UG/KG)				
1,2-Dichloroethene (total)	NA	NA	NA	NA
Acetone	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA
Semi-volatile Organic Compounds (UG/KG)				
2,4-Dinitrotoluene	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA
Butylbenzylphthalate	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA
Diethylphthalate	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA
Explosives (UG/KG)				
2,4-Dinitrotoluene	NA	NA	NA	NA
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	NA	NA	NA	NA
Nitroglycerin	NA	NA	NA	NA
Total Metals (MG/KG)				
Aluminum	17,100	17,900 J	10,500	16,500 J
Antimony	0.43 UL	0.4 UL	0.5 UL	0.42 UL
Arsenic	5.7 K	4.6 J	6 K	5.3 J

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UL - Not detected, biased low

Table 4-5
Detected Compounds in Sediment Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28SD14		IS28SD15	
Sample ID	IS28SD140006	IS28SD140612	IS28SD150006	IS28SD150612
Sample Date	05/14/03	05/14/03	05/14/03	05/14/03
Chemical Name				
Barium	119	133	95.9	112
Beryllium	0.89 J	0.95 B	0.72 J	0.81 B
Cadmium	1.19 U	0.67 B	1.39 U	0.62 B
Calcium	1,350 J	1,410 J	1,520 J	1,290 J
Chromium	26.7	26.5 J	19.2	26.4 J
Cobalt	10.9 J	11.4 J	10.4 J	10.9 J
Copper	13 K	15 J	15.1 K	14.7 J
Iron	23,400	27,800 J	19,500	24,500 J
Lead	15 K	15.6 J	18 K	16.3 J
Magnesium	2,220	2,270	1,620 J	2,090
Manganese	386	484 K	448	303 K
Mercury	0.16 B	0.09 B	0.25 B	0.12 B
Nickel	16.3 K	15.9 J	14.7 J	16.9 J
Potassium	1,230 J	1,200 J	770 J	939 J
Selenium	0.68 U	1.2 J	0.83 B	1.4 J
Silver	2.1 J	1.45 U	2.9 J	1.51 U
Thallium	1.7 B	1.2 J	1.7 B	1.6 J
Vanadium	36	39.1	26 K	37
Zinc	51	55.6 J	72.9	56.3 J
Wet Chemistry (MG/KG)				
% Solids	52	54	42	50
Total organic carbon (TOC)	NA	NA	NA	NA
pH	NA	NA	NA	NA

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UJ - Not detected, Estimated
UL - Not detected biased low

Table 4-6
Detected Compounds in *In Situ* Groundwater Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28MM20	IS28MM23	IS28MM27		IS28MM28	IS28MM42
Sample ID	IS28GW20-0503	IS28GW23-0503	IS28GW27-0503	IS28GW27-0503P	IS28GW28-0503	IS28GW42-0503
Sample Date	05/20/03	05/20/03	05/20/03	05/20/03	05/20/03	05/14/03
Chemical Name						
Volatile Organic Compounds (UG/L)						
Acetone	5 J	10 U	10 U	10 U	10 U	10 U
Carbon tetrachloride	10 U	10 U	2 J	2 J	10 U	10 U
Methylene chloride	10 U	1 J	1 J	10 U	10 U	10 U
Semi-volatile Organic Compounds (UG/L)						
Di-n-butylphthalate	0.9 JB	1 JB	1 JB	10 U	0.9 JB	2 J
bis(2-Ethylhexyl)phthalate	10 U	10 U	10 U	13	10 U	10 U
Explosives (UG/L)						
Nitrobenzene	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Dissolved Metals (UG/L)						
Aluminum	45.4 B	39.7 B	50.9 B	28.8 B	168 B	27.8 B
Arsenic	213	19.7	2.5 B	1.8 U	1.9 B	10.4
Barium	55.2 B	77.9 B	35 B	37 B	54.6 B	466
Cadmium	3.66 U	5.2	3.66 U	3.66 U	3.66 U	3.66 U
Calcium	7,220	3,600 B	1,240 B	1,290 B	2,510 B	21,200
Chromium	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U
Copper	2.38 U	2.38 U	2.9 B	2.38 U	5.9 B	2.38 U
Iron	32,200	12,700	57.3 B	37.4 B	65.7 B	7,490
Lead	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	3.4
Magnesium	4,180 B	1,050 B	982 B	997 B	2,380 B	5,190
Manganese	271	542	59.8	56.4	84.7	501
Mercury	0.03 U	0.06 B	0.11 B	0.03 U	0.03 U	0.03 B
Sodium	15,300	14,900	14,500	14,600	13,400	14,600
Zinc	216	14,100	118	102	667	10,900
Wet Chemistry (MG/L)						
Dissolved organic carbon	5.8	1 U	1 U	1 U	2	NA
Total organic carbon (TOC)	NA	NA	NA	NA	NA	5.8

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L - Biased low
JB - Estimated, not detected above blank

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UL - Not detected, biased low

Table 4-7
Detected Compounds in Monitoring Well Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28MW01		IS28MW02	IS28MW03	IS28MW04	IS28MW05 (Upgradient Background)
Sample ID	IS28MW010903	IS28MW010903P	IS28MW020903	IS28MW030903	IS28MW040903	IS28MW050903
Sample Date	09/09/03	09/09/03	09/09/03	09/10/03	09/09/03	09/10/03
Chemical Name						
Volatile Organic Compounds (UG/L)						
Carbon tetrachloride	10 U	10 U	10 U	10 U	10 U	1 K
Toluene	10 U	10 U	2 J	10 U	10 U	10 U
Semi-volatile Organic Compounds (UG/L)						
4-Methylphenol	10 U	10 U	0.6 J	10 U	10 U	10 U
Caprolactam	10 U	10 U	9	3 J	10 U	90
Total Metals (UG/L)						
Aluminum	553	692	8,590	19,300	4,520	32,800
Antimony	1.74 U	1.74 U	2.1 J	1.74 U	1.74 U	1.74 U
Arsenic	342	347	135	12.1 K	2.13 U	28
Barium	32.4 J	32.9 J	109 J	241	90.4 J	158 J
Beryllium	0.22 U	0.22 U	0.4 J	2.4 J	0.54 J	4.7 J
Cadmium	0.61 B	0.59 B	0.75 B	3.3 J	0.25 U	2.66 U
Calcium	4,620 J	4,620 J	9,330	10,600	3,120 J	2,230 J
Chromium	2.2 J	1.7 J	11.4 K	27.4	13.8 K	44.1
Cobalt	7.2 J	5.8 J	3.9 B	59.8 K	34.9 J	73.6 K
Copper	36.2 K	21.7 J	30 K	50.8	16.5 J	46.8 K
Iron	11,500	11,700	6,870	36,400	4,810	125,000
Lead	4.9 K	6.8	16.3	29.9	4.8 K	17.4
Magnesium	3,420 J	3,440 J	8,710	9,690	2,340 J	3,030 J
Manganese	434	434	143	601	281	627
Nickel	7.4 J	6 J	8.6 J	31.6 B	12.9 J	68.5 B
Potassium	2,050 B	1,570 B	5,170	6,290	2,950 J	2,930 J
Sodium	23,000	24,600	19,400	25,000	11,500	17,400
Vanadium	0.74 U	1.3 B	18.9 J	61.8 K	14.5 J	71.5 K
Zinc	951	969	580	1,620	100	153
Dissolved Metals (UG/L)						
Aluminum	252	338	3,840	8,190	1,130	17,300
Antimony	1.74 U	1.74 U	3.1 J	1.74 U	1.74 U	1.74 U

B - Not detected above blank
J - Estimated
K -Biased high
L - Biased low
JB - Estimated, not detected above blank

R - Unreliable
U - Not detected
UJ - Not detected, Estimated
UL - Not detected, biased low

Table 4-7
Detected Compounds in Monitoring Well Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28MW01		IS28MW02	IS28MW03	IS28MW04	IS28MW05 (Upgradient Background)
Sample ID	IS28MW010903	IS28MW010903P	IS28MW020903	IS28MW030903	IS28MW040903	IS28MW050903
Sample Date	09/09/03	09/09/03	09/09/03	09/10/03	09/09/03	09/10/03
Chemical Name						
Arsenic	317	292	93.5	4.2 J	2.13 U	13.7 K
Barium	31.9 J	31.6 J	107 J	182 J	68.8 J	119 J
Beryllium	0.22 U	0.22 U	0.33 J	0.88 B	0.33 J	2.5 J
Cadmium	0.4 B	0.56 B	10 K	8 K	0.25 U	10 K
Calcium	4,630 J	4,430 J	8,960	9,260	2,740 J	2,000 J
Chromium	1.5 J	0.93 J	6.1 J	12.2 K	3.4 J	23.4
Cobalt	6.6 J	6.4 J	3.6 B	41.1 J	27.3 J	50.4 K
Copper	10.3 J	7.6 B	22 J	31 K	14.8 J	36
Iron	12,900	13,200	3,870	15,100	981	65,300
Lead	2.2 J	2.2 J	7.8	12.5	1.56 U	9.1
Magnesium	3,390 J	3,320 J	8,630	7,590	1,940 J	2,280 J
Manganese	441	434	127	376	218	436
Nickel	5.1 J	4.8 J	6.4 J	28.9 B	8.5 J	38.6 B
Potassium	1,200 B	1,390 B	4,750 J	5,370	2,460 B	2,490 J
Sodium	20,500	19,400	20,400	25,500	11,700	17,700
Vanadium	0.74 U	0.74 U	10.7 J	23.5 J	3.1 B	38.8 J
Zinc	886	868	320	1,230	75.1	82.8
Wet Chemistry (MG/L)						
Dissolved organic carbon	6.6	6	NA	NA	1 U	2

B - Not detected above blank
J - Estimated
K -Biased high
L - Biased low
JB - Estimated, not detected above blank

R - Unreliable
U - Not detected
UJ - Not detected, Estimated
UL - Not detected, biased low

Table 4-8
Detected Compounds in Background *In Situ* Groundwater Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28MM01	IS28MM16	
Sample ID	IS28GW01-0503	IS28GW16-0503	IS28GW16-0503P
Sample Date	05/15/03	05/15/03	05/15/03
Chemical Name			
Volatile Organic Compounds (UG/L)			
Acetone	5 J	5 J	10 U
Carbon tetrachloride	10 U	6 J	6 J
Dissolved Metals (UG/L)			
Iron	1,860	178	168
Manganese	160	29.1	26.8
Sodium	16,100	16,800	16,000
Zinc	135	119	104
Wet Chemistry (MG/L)			
Total organic carbon (TOC)	2	1	1

B - Not detected above blank
J - Estimated
K -Biased high
L - Biased low
JB - Estimated, not detected above blank

R - Unreliable
U - Not detected
UJ - Not detected, Estimated
UL - Not detected, biased low

Table 4-9
Detected Compounds in Surface Water Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28SWSD01	IS28SWSD02	IS28SWSD03	
Sample ID	IS28SW01-0503	IS28SW02-0503	IS28SW03-0503	IS28SW03-0503P
Sample Date	05/21/03	05/21/03	05/20/03	05/20/03
Chemical Name				
Explosives (UG/L)				
Nitrobenzene	0.26 UL	0.15 L	0.26 U	0.26 UL
Total Metals (UG/L)				
Arsenic	1.8 U	3.8 J	6.7 B	7 B
Barium	67.4 J	49.9 J	35 J	35.1 J
Cadmium	6.3 K	7.3 K	5.3 K	7.6 K
Calcium	6,340	4,350 J	2,900 J	2,880 J
Cobalt	0.63 J	2.2 J	1.5 B	2.2 B
Copper	2.38 U	24.3 B	15.9 J	16.6 J
Iron	63.6 B	6,600	173 J	194 J
Lead	0.91 U	61.5	5.9 B	6.9 B
Magnesium	1,820 J	1,290 J	736 J	717 J
Manganese	10.5 J	45.8	27.1 K	27 K
Nickel	10.4 J	5.4 J	11.7 U	11.7 U
Potassium	1,240 B	1,510 B	1,320 J	1,320 J
Sodium	21,700	17,800	11,900	11,700
Zinc	3,900	4,140	2,830	2,890
Dissolved Metals (UG/L)				
Barium	63.8 J	50.5 J	35 J	37.2 J
Cadmium	6.1 K	7.4 K	5.6 K	4.7 J
Calcium	6,240	4,420 J	3,010 J	3,210 J
Cobalt	0.83 J	2.3 J	1.4 B	1.5 B
Iron	8.8 B	678	83.9 J	80.6 J
Magnesium	1,780 J	1,300 J	715 J	733 J
Manganese	8.4 J	44.2	27.3 K	28.4 K
Nickel	4 J	4.5 J	11.7 U	11.7 U
Potassium	1,440 B	1,010 B	1,150 J	1,130 J
Sodium	21,100	19,200	12,900	13,700
Zinc	3,760	4,420	2,790	2,880
Wet Chemistry (MG/L)				
Dissolved organic carbon	1	2	2	2

B - Not detected above blank
J - Estimated
K -Biased high
L - Biased low
JB - Estimated, not detected above blank

R - Unreliable
U - Not detected
UJ - Not detected, Estimated
UL - Not detected, biased low

Table 4-10
Detected Compounds in Background Groundwater Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28MW01	
Sample ID	IS28MW010903	IS28MW010903P
Sample Date	09/09/03	09/09/03
Chemical Name		
Semi-volatile Organic Compounds (UG/L)		
bis(2-Ethylhexyl)phthalate	250 J	290 J
Total Metals (UG/L)		
Aluminum	553	692
Arsenic	342	347
Barium	32.4 J	32.9 J
Calcium	4,620 J	4,620 J
Chromium	2.2 J	1.7 J
Cobalt	7.2 J	5.8 J
Copper	36.2 K	21.7 J
Iron	11,500	11,700
Lead	4.9 K	6.8
Magnesium	3,420 J	3,440 J
Manganese	434	434
Nickel	7.4 J	6 J
Sodium	23,000	24,600
Zinc	951	969
Dissolved Metals (UG/L)		
Aluminum	252	338
Arsenic	317	292
Barium	31.9 J	31.6 J
Calcium	4,530 J	4,430 J
Chromium	1.5 J	0.93 J
Cobalt	6.6 J	6.4 J
Copper	10.3 J	7.6 B
Iron	12,900	13,200
Lead	2.2 J	2.2 J
Magnesium	3,390 J	3,320 J
Manganese	441	434
Nickel	6.1 J	4.8 J
Sodium	20,500	19,400
Zinc	886	868

B - Not detected above blank
J - Estimated
K -Biased high
L - Biased low
JB - Estimated, not detected above blank

R - Unreliable
U - Not detected
UJ - Not detected, Estimated
UL - Not detected, biased low

Table 4-10
Detected Compounds in Background Groundwater Data
Site 28 RI Report, NDWIH
Indian Head, Maryland

Station ID	IS28MW01		IS28MW01	
Sample ID	IS28MW010903		IS28MW010903P	
Sample Date	09/09/03		09/09/03	
Chemical Name				
Wet Chemistry (MG/L)				
Dissolved organic carbon	6.6		6	

B - Not detected above blank
J - Estimated
K -Biased high
L - Biased low
JB - Estimated not detected above blank

R - Unreliable
U - Not detected
UJ - Not detected, Estimated
UL - Not detected biased low

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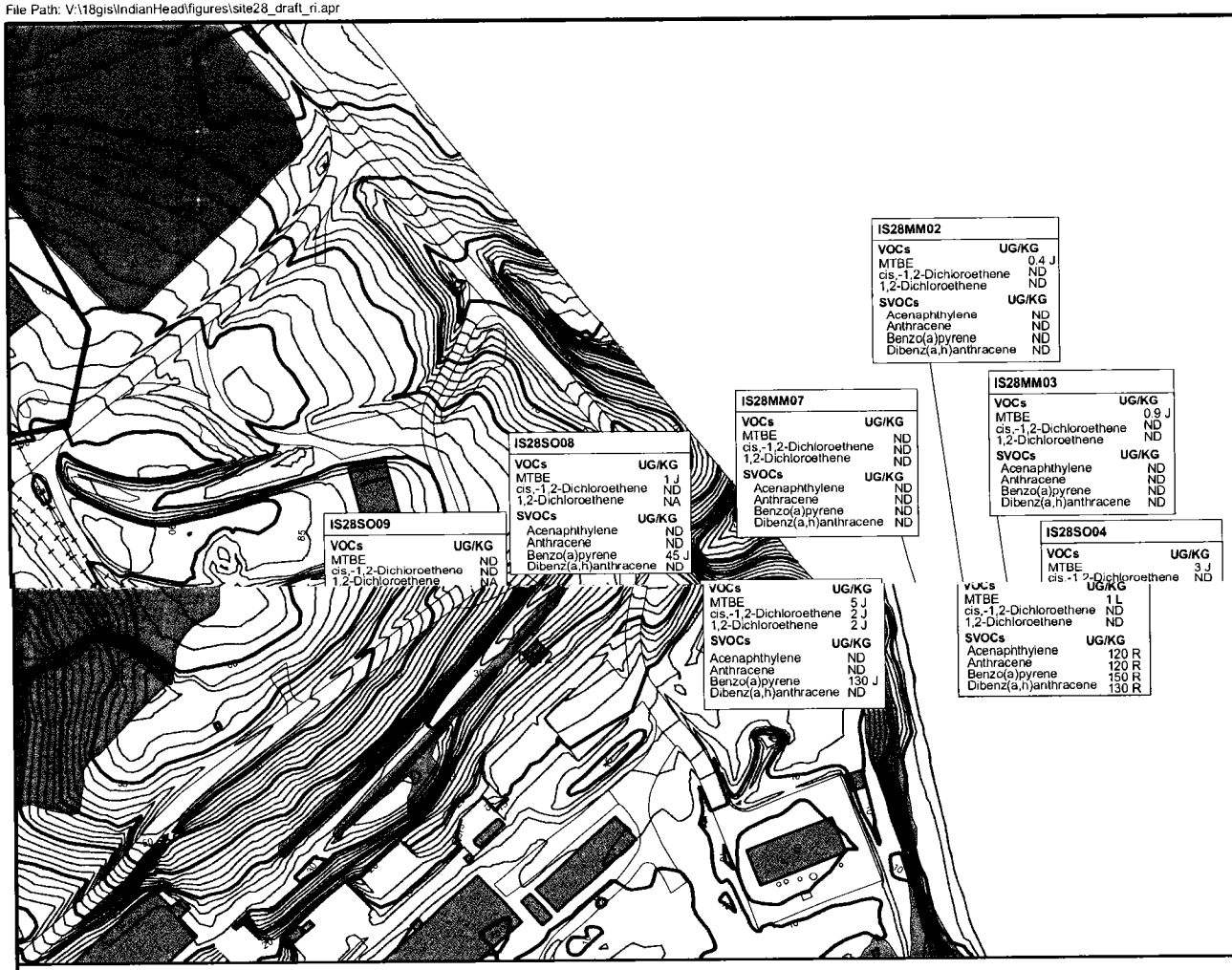


LEGEND

Sample locations are labeled with the Station ID, as described in Section 3.2.1

- Surface Soil Sample Location
- Zone Boundary
- Fence Line
- IR Site
- Five foot Contours
- One Foot Contours
- Buildings
- Railroads
- Roads

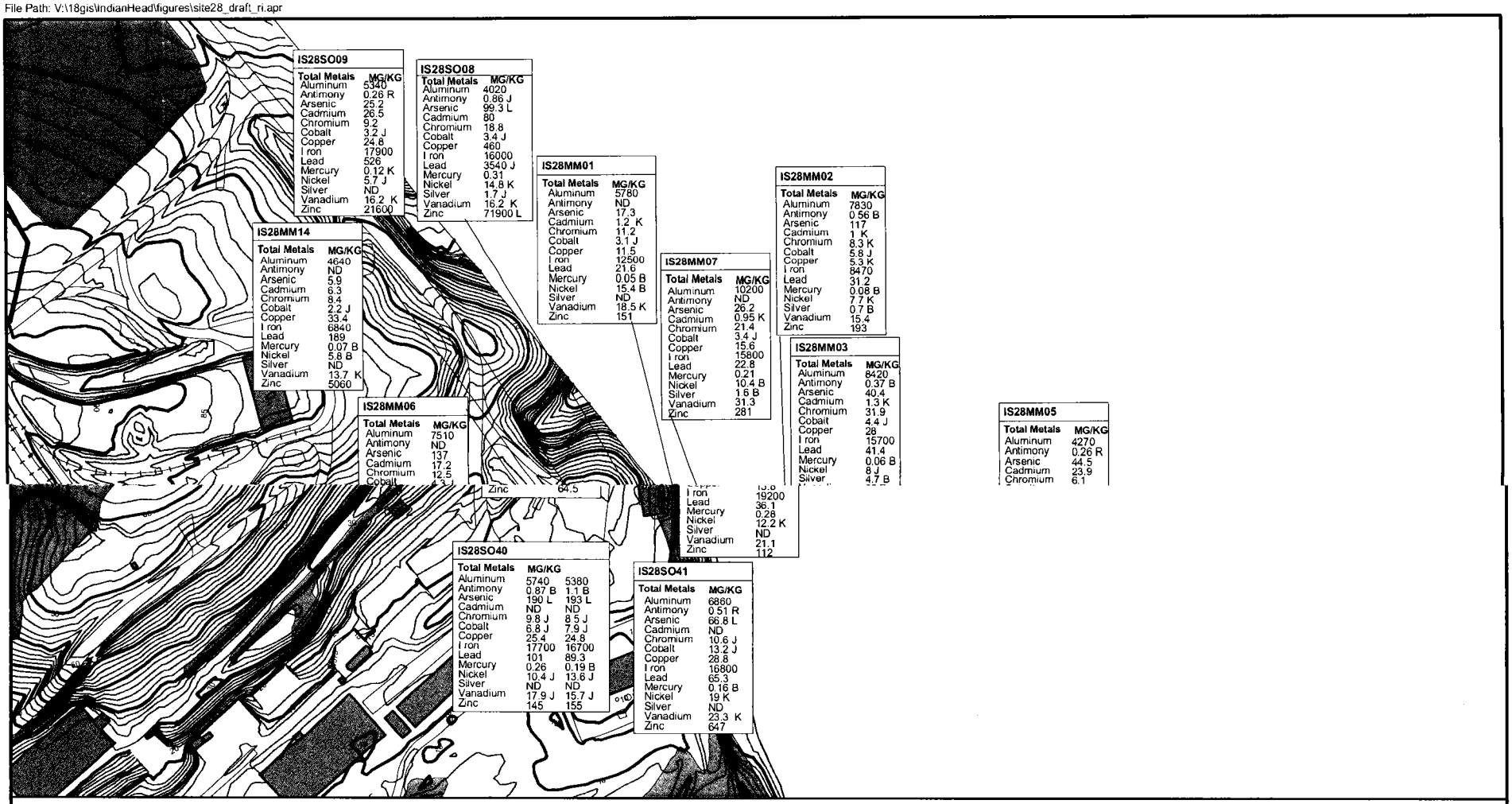
N

0 100 200 300 400 Feet

Figure 4-1
Selected VOCs and SVOCs in Surface Soil
Site 28 RI Report
NDWIH Indian Head, Maryland

CH2MHILL

File Path: V:\18gis\IndianHead\figures\site28_draft_ri.apr



LEGEND

Sample locations are labeled with the Station ID, as described in Section 3.2.1

- Surface Soil Sample Location
- Zone Boundary
- Fence Line
- IR Site
- Five foot Contours
- One Foot Contours
- Buildings
- Railroads
- Roads

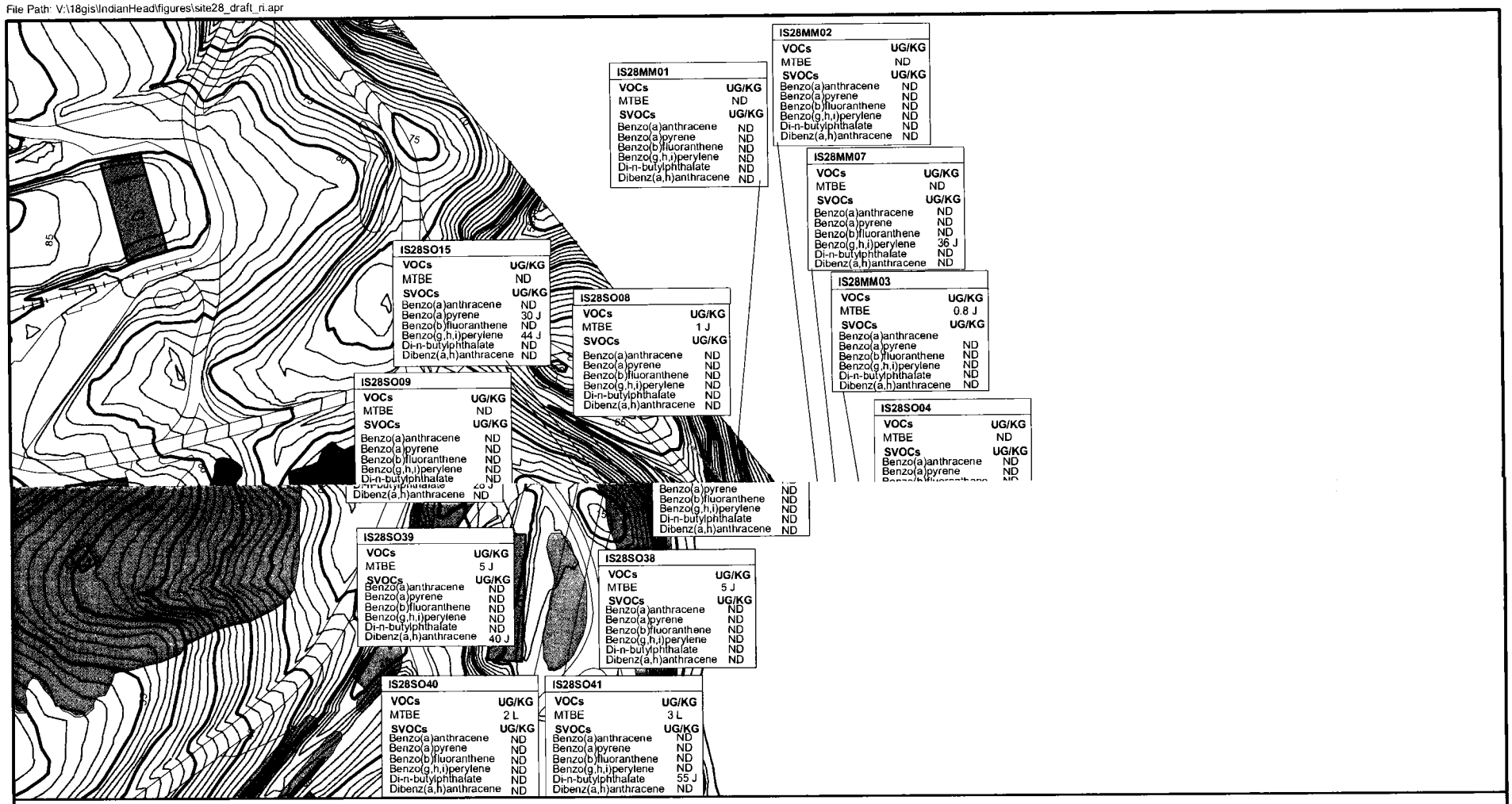
N

0 100 200 300 400 Feet

Figure 4-2
Selected Total Metals in Surface Soil
Site 28 RI Report
NDWIH Indian Head, Maryland

CH2MHILL

File Path: V:\18gis\IndianHead\figures\site28_draft_ri.apr



LEGEND

Sample locations are labeled with the Station ID, as described in Section 3.2.1

- Subsurface Sample Location
- Zone Boundary
- Fence Line
- IR Site
- Five foot Contours
- One Foot Contours
- Buildings
- Railroads
- Roads

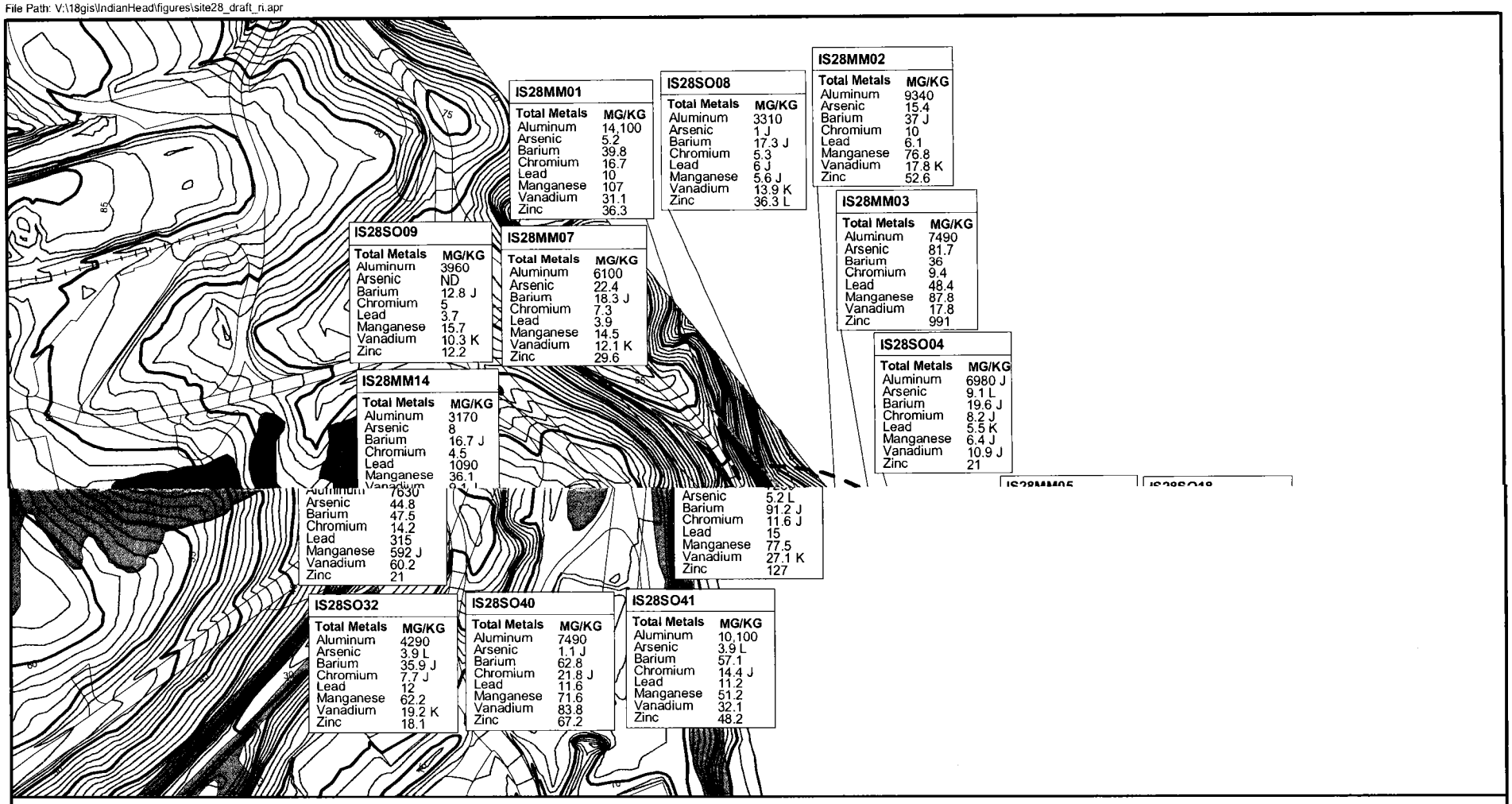
N

0 80 160 240 320 Feet

Figure 4-3
Selected VOCs and SVOCs in Subsurface Soil
Site 28 RI Report
NDWIH Indian Head, Maryland

CH2MHILL

File Path: V:\18gis\IndianHead\figures\site28_draft_ri.apr



LEGEND

Sample locations are labeled with the Station ID, as described in Section 3.2.1

- Subsurface Sample Location
- Zone Boundary
- Fence Line
- IR Site
- Five foot Contours
- One Foot Contours
- Buildings
- Railroads
- Roads

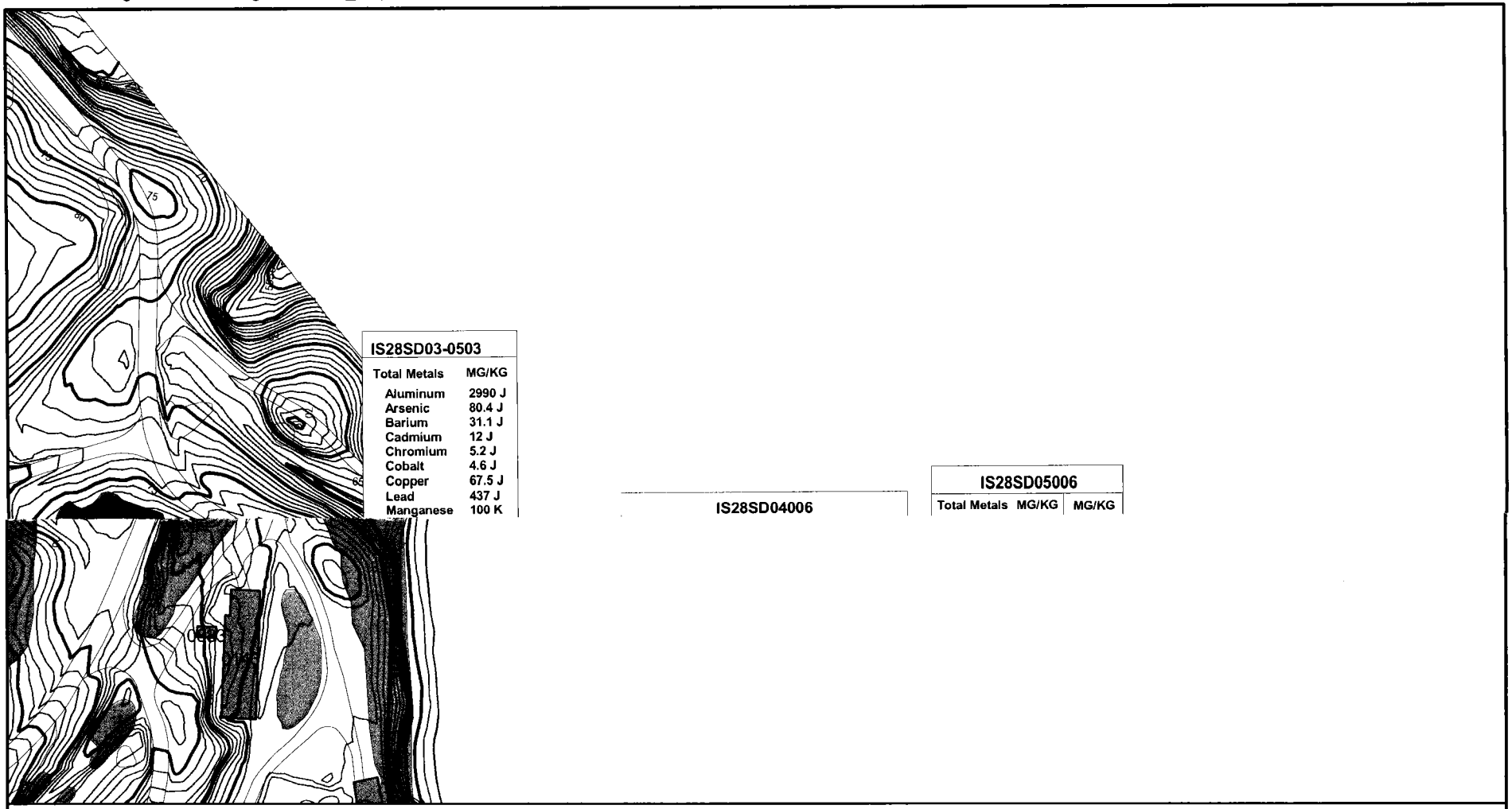
N

0 80 160 240 320 Feet

Figure 4-4
Selected Total Metals in Subsurface Soil
Site 28 RI Report
NDWIH Indian Head, Maryland

CH2MHILL

File Path: V:\18gis\IndianHead\figures\site28_ri.apr



LEGEND

Sample locations are labeled with the Sample ID, as described in Section 3.2.2

- Mattawoman Creek Sediment Sample Location
- Zone Boundary
- Fence Line
- IR Site
- Five foot Contours
- One Foot Contours
- Buildings
- Railroads
- Roads

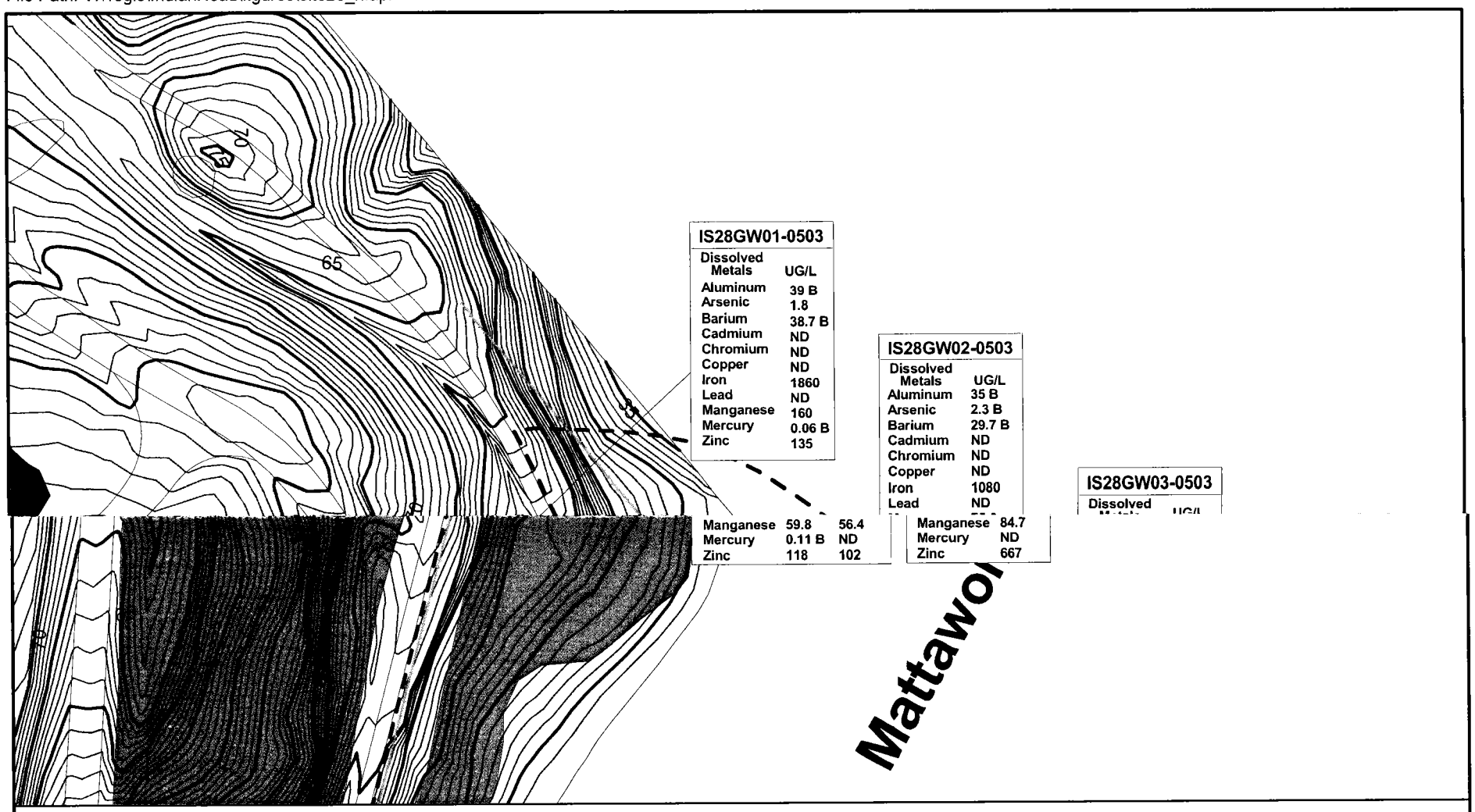
N

0 75 150 225 300 Feet

Figure 4-5
Selected Total Metals in Sediment
Site 28 RI Report
NDWIH Indian Head, Maryland

CH2MHILL

File Path: V:\18gis\IndianHead\figures\site28_ri.apr



LEGEND

Sample locations are labeled with the Sample ID, as described in Section 3.2.2

- Sample Location
- Zone Boundary
- Fence Line
- IR Site
- Five foot Contours
- One Foot Contours
- Buildings
- Railroads
- Roads

N

0 40 80 120 Feet

Figure 4-6
Selected Filtered Metals in In Situ Groundwater Samples
Site 28 RI Report
NDWIH Indian Head, Maryland

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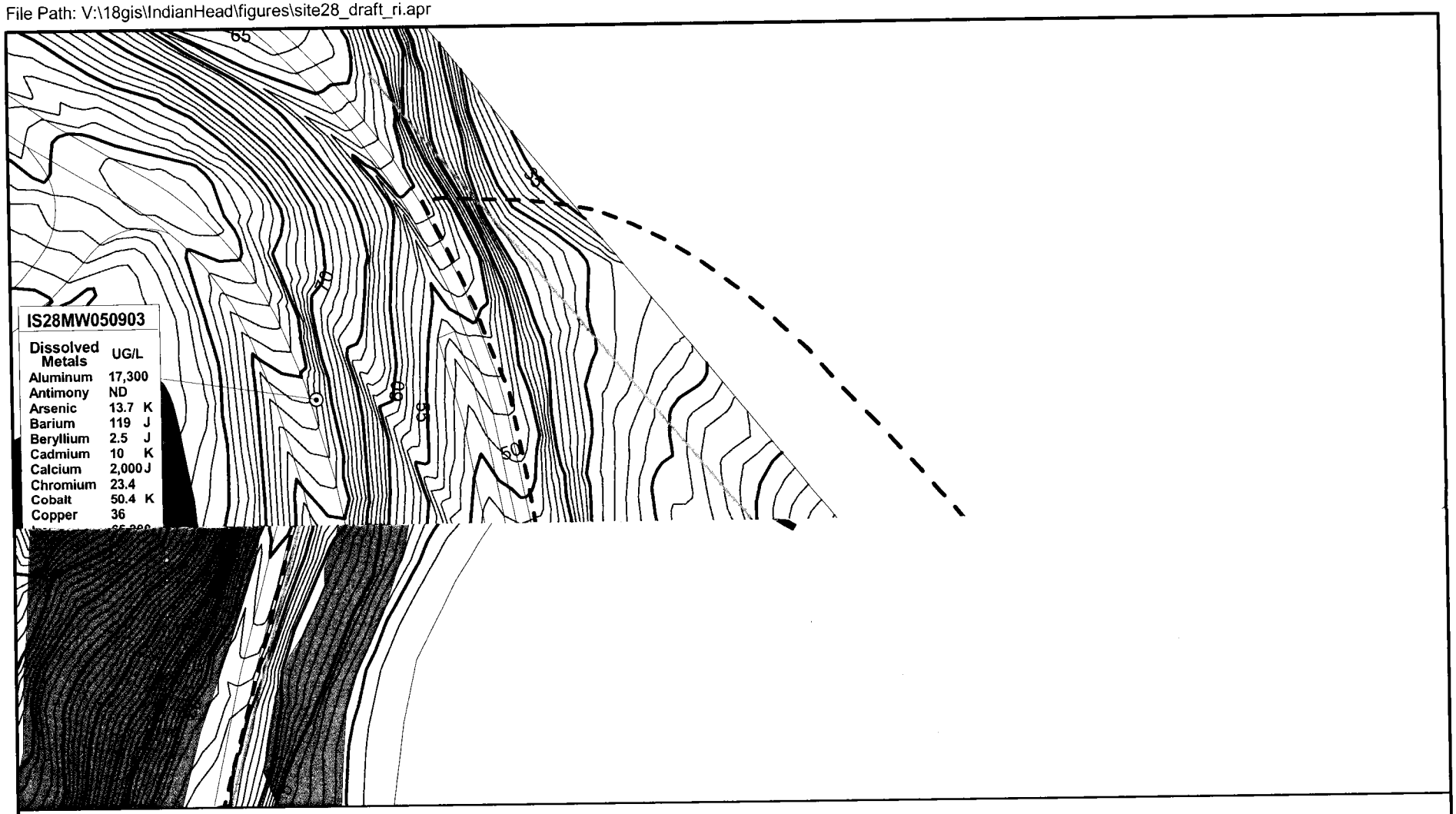
File Path: V:\18gis\IndianHead\figures\site28_draft_ri.apr



LEGEND

Sample locations are labeled with the Sample ID, as described in Section 3.2.2

- Monitoring Well Location
- Zone Boundary
- Fence Line
- IR Site
- Five foot Contours
- One Foot Contours
- Roads

N

0 40 80 120 Feet

Figure 4-7
Filtered Metals in Monitoring Well Samples
Site 28 RI Report
NDWIH Indian Head, Maryland

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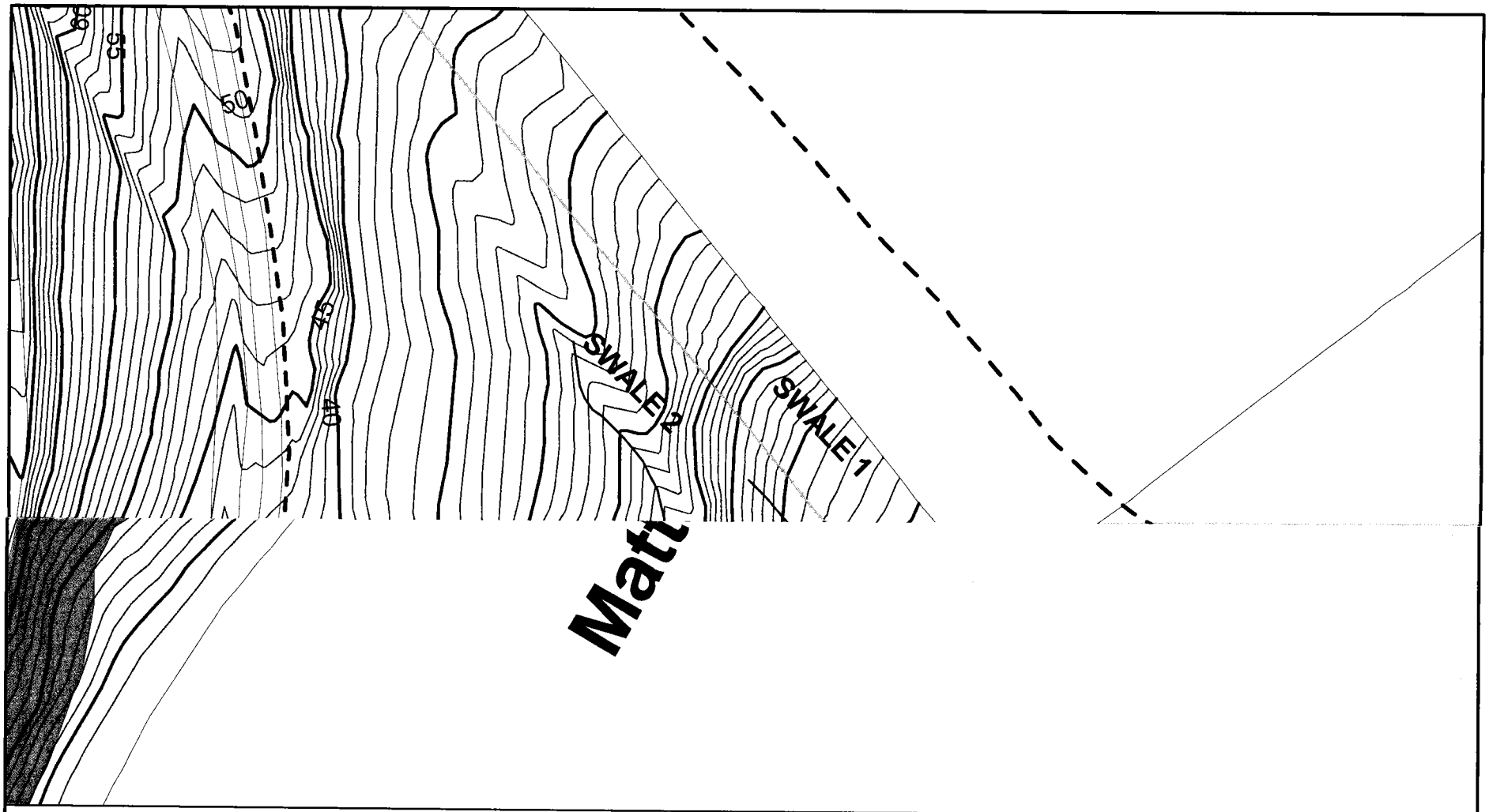
File Path: V:\18gis\IndianHead\figures\site28_ri.apr



LEGEND

Sample locations are labeled with the Sample ID, as described in Section 3.2.2

- Sample Location
- Zone Boundary
- Fence Line
- IR Site
- Five foot Contours
- One Foot Contours
- Roads

N

0 30 60 90 Feet

Figure 4-8
Total Metals in Surface Water Samples
Site 28 RI Report
NDWIH Indian Head, Maryland

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SECTION 5

Contaminant Fate and Transport

The fate and transport of contaminants in soil, sediment, surface water, and groundwater at NDWIH Site 28 are discussed in this section. The fate and transport are described to support the human-health and ecological risk assessments and to aid in defining remedial alternatives.

5.1 Source Area and Mechanisms of Release

Based on the chemical and physical data gathered for the site and information provided by NDWIH, the following potential contaminant source areas have been identified or may exist at the site:

- Surface and subsurface soil contaminated by historic site operations;
- Groundwater contaminated by historic site operations;
- Sediment contaminated by historic site operations; and
- Surface water contaminated by historic site operations.

Known historic site operations that likely contributed to these sources included the former zinc recovery furnace, the burning grounds, and the small burning cage:

- The former zinc recovery furnace in Zone A (refer to Figures 1-3 and 2-1) was used to recover zinc from various metals and scrap through a melting process by the Navy from 1928 to the early 1950s (Dolph, 2001). The zinc recovery furnace building was demolished some time during the early 1950s, when the operation was moved off of Site 28;
- The old Shoreline Burning Cage was part of the Original NOS Burning Ground, in Zone B (refer to Figures 1-3 and 2-1), which was used for basewide debris disposal (Dolph, 2001). The exact location where debris was burned is unknown in Zone B;
- The old Small Burning Cage in Zone A was part of the Original NOS Burning Ground. It was used to burn debris and is thought to have been located to the south of Well 14. The exact location of the former burning cage is unknown; and
- Physical dumping and standard (at the time) pesticide/herbicide application are other site operations that may be responsible for contamination.

The primary mechanisms for contaminant transport from the source areas at the site are believed to be:

- Transport of contaminated surface soil (or contaminants in the surface soil) into the air by wind erosion (i.e., entrainment) or volatilization, followed by subsequent deposition;

- Precipitation causing erosion of surface soil from the site and deposition in Mattawoman Creek sediments and surface water;
- Precipitation causing leaching of contaminants from the surface soil and transport by surface runoff to Mattawoman Creek sediment and surface water;
- Leaching of contaminants from the sediment to the surface water in Mattawoman Creek;
- Adsorption of contaminants from the surface water to the sediment in Mattawoman Creek;
- Precipitation causing leaching of contaminants from the surface soil to the subsurface soil;
- Leaching of contaminants from the surface and subsurface soil to groundwater; and
- Migration of contaminants in groundwater.

These mechanisms are discussed further for the representative contaminants in Section 5.2.2.

5.2 Contaminant Mobility, Migration, and Persistence

The probable environmental fate and transport of the potential contaminants at the site are determined by their physical, chemical, and biological interaction with the environment. The mobility and persistence of the chemicals in the environment are two key characteristics in determining probable behavior. Mobility is the potential for a chemical to migrate from a site, and persistence is a measure of how long a chemical will remain in the environment. Environmental factors that affect the mobility and persistence of the contaminants include pH, concentration of other chemicals or constituents in the media, soil moisture, ORP, water chemistry, organic-matter content, and the presence of microorganisms. In addition, the behavior is determined by the physical and hydraulic properties of the water-bearing units through which the contaminants are being transported.

5.2.1 Contaminant Groups

Organic and inorganic contaminants were detected in environmental media at the site. The nature and extent of these contaminants are discussed in detail for the different media in Section 4. Discussing the fate and transport of all of these contaminants is not practical in the scope of this report. Instead, because contaminants with similar properties in a group tend to behave similarly in the environment, the mobility and persistence of these contaminants are discussed as groups (e.g., SVOCs and inorganics), with reference to representative contaminants as indicators of the behavior of the primary contaminants of interests in the group and likely indicators of the overall group's behavior.

Certain contaminants were selected to represent the range of contaminants associated with the site. The representative contaminants were selected based on concentrations, frequency of occurrence, occurrence in several media, variable migration potential, and likely contribution to overall risk to human health and the environment. The contaminants discussed in this section are listed in Table 5-1 and their specific fate and transport

properties are described below. These properties provide a range of the properties characteristic of each of the contaminant groups.

5.2.1.1 SVOCs

SVOCs were detected throughout the Site 28 media at varying concentrations. Among the SVOCs detected were a subset known as phthalates. Phthalates are associated typically with plastics and sometimes herbicides. Bis(2-ethylhexyl)phthalate will be selected for fate and transport discussion of phthalates.

5.2.1.2 Inorganics

Numerous inorganics were detected at Site 28. Metals are common mineral constituents of soil and groundwater, as well as potentially site-related contaminants. Appendix F presents a comparison of detected inorganic concentrations to basewide background concentrations.

For purposes of environmental fate and transport, one of the most important distinguishing characteristics of metals is sensitivity to oxidation-reduction (redox) conditions. Chromium was selected to represent redox-sensitive metals (e.g., arsenic, iron, manganese, zinc, cadmium, copper, vanadium, antimony, thallium, and cobalt) and lead to represent non-redox-sensitive metals (e.g., aluminum, barium, and nickel). The environmental behavior of other metals that were detected, believed to be site-related, exceeded screening criteria, and/or contributed to risk will be sufficiently similar to either chromium or lead for this purpose of this report; however, zinc will be discussed specifically since a zinc recovery furnace was used historically at Site 28. In addition, arsenic will be discussed specifically since it contributed duly to risk, and mercury will be addressed since it is a volatile metal.

5.2.2 Representative Contaminants

The following chemical-specific profiles briefly describe how the chemical and physical properties of the representative chemicals listed in Table 5-1 affect their mobility and persistence in the environment. Refer to Section 4 for the nature and extent of contamination discussion for Site 28, Section 6 for the HHRA, and Section 7 for the ERA.

5.2.2.1 Bis(2-ethylhexyl)phthalate

Bis(2-ethylhexyl)phthalate was detected in surface soil, subsurface soil, sediment, and DPT groundwater samples at the site, but not in the monitoring well groundwater or surface water samples. Phthalates constitute a class of esters that are very common in industrial use. They are typically used as plasticizers to improve flexibility, or as solvents or insect repellents (Fetter, 1993). Of note is that bis(2-ethylhexyl)phthalate, along with other organic compounds (e.g., acetone, methylene chloride, toluene, 2-butanone, di-n-butylphthalate, and di-n-octylphthalate), is a common laboratory contaminant (USEPA, 1994a).

Slightly higher vapor pressure and water-solubility, as well as lower organic carbon partition coefficients (K_{oc}), indicate that bis(2-ethylhexyl)phthalate may not adsorb readily to organic matter in soil as strongly as other SVOCs, such as benzo(a)pyrene; however, due to the high organic content of the Site 28 soils, bis(2-ethylhexyl)phthalate should sorb to soil and not leach appreciably.

Table 5-2 presents the soil-screening levels (SSLs) for the representative contaminants, assuming a dilution-attenuation factor (DAF) in the groundwater of 20, based on USEPA (1996, 1998, 2001) guidance for protection of groundwater from soil contamination and the USEPA Region III Risk-Based Concentration Table (USEPA, 2003). Bis(2-ethylhexyl)phthalate was detected in the soil at concentrations below its SSL of 2,889 mg/kg, suggesting that bis(2-ethylhexyl)phthalate is not migrating from soil to groundwater at Site 28. Groundwater analytical results confirm this (refer to Section 4).

Soil contaminated with bis(2-ethylhexyl)phthalate can potentially be released to the atmosphere as dust during windy conditions or site activities (e.g., soil excavation), followed by deposition downwind at the site or off the site. Although wind erosion at the site occurs in Zone A where there is little vegetative cover, there is virtually no vehicular traffic on the site to effectively mobilize dust into the air.

Because of its relatively low vapor pressure (i.e., 1.42×10^{-07} mm Hg), evaporation of bis(2-ethylhexyl)phthalate from soil is not expected to be significant. Released to water, such as Mattawoman Creek, bis(2-ethylhexyl)phthalate, as well as other phthalates, should partition to solids, such as sediment and biota, due to their range of octanol-water partition coefficients (K_{ow}). The most significant fate process for this phthalate in soil will be biodegradation.

5.2.2.2 Arsenic

Arsenic was detected in all media at Site 28 and exceeded the representative background concentration in virtually every surface soil sample. It was determined to contribute to risk in human and/or ecological receptors in all media at Site 28.

The predominant form of arsenic in oxidizing environments is arsenate (As^{+5}). Under slightly reducing and acidic conditions, such as temporary flooding, the more toxic and mobile arsenite (As^{+3}) form dominates (Bodek et al., 1988). Arsenite and methylated arsine predominate in moderately reducing soil, such as tidal marshes and consistently flooded soil. In natural environments, arsenic also may exist in the As^{-3}- and As^{0}-states, but only under highly reducing conditions. Such reducing conditions do not appear to exist at the site (refer to ORP data in Table 3-3).

Transport and partitioning of arsenic in water depend on the oxidation state of the arsenic and on interactions with other materials present. Organic matter, divalent metals, and dissolved sulfide enhance the reduction of the arsenic valence state to a more mobile form. Soluble forms move with water, but arsenic may be adsorbed from water onto sediment or soil, especially clays, iron oxyhydroxides and oxides, aluminum hydroxides, manganese compounds, and organic material (Bodek et al, 1998). Adsorption to oxyhydroxides is the most important natural adsorption process. Microbes are capable of methylating arsenic to trimethylarsine gas, which is a more-volatile and more-mobile form than inorganic arsenic (Spectrum, 2004).

Arsenic-contaminated surface soil at Site 28 can be transported to nearby drainage ditches and Mattawoman Creek in Zone A by wind erosion and/or overland flow, because most of Zone A is not vegetated and is steeply sloped in most areas (whereas, Site B is more flat and completely vegetated). Arsenic can be transported by overland flow either in the dissolved phase or adsorbed to suspended particulates. The load carried by surface runoff is

deposited in the drainage swales and Mattawoman Creek as the flow rate declines after a storm or snow melt. The subsequent sediment would usually be deposited under oxidizing conditions and, therefore, transported arsenic may be oxidized if the transport times are long enough (reducing the potential transport of arsenic); however, overland travel times at Site 28 would likely be minimal due to the close proximity to Mattawoman Creek.

Arsenic was detected in virtually every soil sample above its SSL of 0.026 mg/kg (refer to Table 5-2), and was detected in the groundwater at elevated concentrations, suggesting that arsenic in Site 28 soil is leaching into the groundwater; however, onsite groundwater concentrations are comparable to background groundwater concentrations.

Table 5-3 shows that the retardation factor for arsenic at Site 28 ranges from 4 to 51. Since this range is relatively low compared to other contaminants, and since elemental metals do not degrade, arsenic will tend to maintain a higher concentration with distance downgradient from the site than will degradable contaminants. Elevated concentrations of arsenic appear to be located in the middle of the site (i.e., at location IS28MM20), suggesting a possible source area of arsenic-contaminated soil. The discharge location of Mattawoman Creek borders the site, allowing arsenic to dissolve into surface water or sorb to sediment quickly, possibly before it can be sorbed by organic matter and oxides in subsurface soil.

5.2.2.3 Chromium

Chromium was detected in all media at Site 28 and exceeded representative background concentrations in surface and subsurface soil. Note that the HHRA in Section 6 assumes conservatively that any chromium present in groundwater is present as hexavalent chromium (Cr^{+6}).

Chromium is a naturally occurring element (as a component of more than 80 identified minerals) that occurs in four valence states: +6, +4, +3, and +2. Cr^{+4} and Cr^{+2} are thermodynamically unstable and are rarely found in the environment. Cr^{+6} and trivalent chromium (Cr^{+3}) are commonly encountered in the subsurface environment as naturally occurring, as well as from anthropogenic influences. Cr^{+3} is the most stable form of chromium. Cr^{+6} is a suspected carcinogen, whereas Cr^{+3} is considered an essential trace element in humans (USEPA, 1980a).

Transport and partitioning of chromium in water depend on the oxidation state of the chromium and on interactions with other materials present (e.g., organic matter and alkalinity). Soluble forms move with water, but chromium may be adsorbed from water onto sediment or soil, hydrous metal oxides, and organic material (Bodek et al., 1988). Clays and hydrous metal oxides do not typically adsorb Cr^{+6}, but Cr^{+6} is readily adsorbed by activated carbon, suggesting that adsorption to the Site 28 organic matter in soils is an important phenomenon. Organic matter in soils also can cause reduction of Cr^{+6} to Cr^{+3}, whereas manganese oxides can oxidize Cr^{+3} to Cr^{+6}. In contrast to Cr^{+6}, adsorption of Cr^{+3} increases as pH increases. In addition, adsorption is highly dependent on the cation exchange capacity (CEC) of the soil, the presence of hydrous metal oxides, and the presence of other anions (e.g., sulfate and phosphate) competing for adsorption sites (Bodek et al., 1988).

Under the conditions found in most subsurface environments, the majority of chromium will be present as Cr^{+3}. The proportions of chromium present as Cr^{+3} and Cr^{+6} can be

predicted for a given set of pH, ORP, and concentration values, using a diagram plotting the chromium speciation as a function of ORP and pH (i.e., an Eh-pH diagram). Based on the conditions at Site 28 (i.e., field measurements of pH ranging from 3.34 to 7.30 and ORP ranging from -10 mV to 295 mV; refer to Table 3-3), chromium in the groundwater at Site 28 likely will be in the form of Cr^{+3}, either as chromium hydroxide ions ($CrOH^{2+}$) or as insoluble chromium oxide (Cr_2O_3), which will dissolve to form more chromium hydroxide ions (Brookins, 1988).

Chromium-contaminated surface soil at the site can be transported to nearby drainage ditches and Mattawoman Creek by wind erosion and/or by overland flow in the dissolved phase or as suspended particulates. The subsequent sediment can be deposited under oxidizing conditions, possibly enhancing the mobility of chromium.

Chromium was detected above its Cr^{+6} SSL of 42 mg/kg in surface and subsurface soil, and detected at elevated concentrations in groundwater, suggesting that the surface and subsurface soils at Site 28 contribute to chromium groundwater contamination at Site 28. Table 5-3 shows that the retardation factor for chromium at Site 28 ranges from 50 to 2,161, suggesting a longer residence time on the site for chromium than for arsenic. Chromium was detected at minimal concentrations in background groundwater samples and, similar to arsenic, elevated concentrations of chromium appear to be located in the middle of the site (i.e., at location IS28MM20). This suggests a possible source area of chromium-contaminated soil. The discharge location of Mattawoman Creek borders the site, allowing for chromium to dissolve into surface water or sorb to sediment; however, the higher retardation of chromium in the Site 28 environment suggests that, if present, Cr^{+6} can readily be sorbed by organic matter and oxides in subsurface soil.

5.2.2.4 Lead

Lead was detected in all media at Site 28 and exceeded representative background concentrations in surface and subsurface soil. The dominant species of lead in the aqueous solution is Pb^{+2} under acidic conditions and Pb^{+2}-carbonate complexes under alkaline conditions. Adsorption and precipitation increase with increasing pH, with most lead precipitating out at pH greater than 6 (Bodek et al., 1988). In oxidizing systems (e.g., Site 28), the least soluble common forms of lead are the carbonate, hydroxide, and hydroxycarbonate (Spectrum, 2004). In reducing conditions where sulfur is present, lead sulfide is the stable solid.

Lead is an extremely stable metal, although it dissolves in acid. Due to its very low vapor pressure, volatilization of lead from the soil and water is negligible, although benthic microbes may convert methylated lead to tetramethyl lead, which tends to volatilize to the atmosphere (Spectrum, 2004). Lead effectively partitions from water to the sediment by adsorption to organic matter and clay minerals, precipitation as insoluble salt (especially as lead sulfide), and reaction with hydrous iron and manganese oxide. Under most circumstances, adsorption predominates as the process for removing lead from solution; however, lead complexes commonly fill up adsorption sites in soil to a point called the lead immobilization capacity, at which point the soil cannot adsorb any more lead. Under environmental conditions, lead likely will remain very stable, fixed to the soil matrix, with little, if any, dissolution into groundwater.

Lead bound to the soil can transported by overland flow or be released to the atmosphere as dust during windy conditions or site activities (e.g., soil excavation), followed by deposition downwind at the site or off the site. Lead was detected above its SSL of 400 mg/kg in surface and subsurface soil (although lead's SSL is actually the lead screening level based on USEPA (1994b, 1998) guidance); however, lead was detected at minimal concentrations in onsite and background groundwater samples, suggesting that the lead is sorbed to surface and subsurface soils at Site 28. Still, elevated concentrations of lead in the middle of the site (i.e., at location IS28MM20) suggest a possible source area of lead-contaminated soil. Elevated lead concentrations in the sediment support that lead is bound to the soil (and sediment) and is transported by overland flow and erosion.

5.2.2.5 Mercury

Mercury was detected in surface and subsurface soil, sediment, and DPT groundwater samples (but not monitoring well groundwater samples) at Site 28. Mercury concentrations exceeded representative background concentrations in surface and subsurface soil.

Two characteristics of mercury distinguish it from other metals: volatility and biotransformation. Its high volatility is a great concern due to its high toxicity. Elemental mercury volatilizes into the atmosphere. Some mercury in the atmosphere is associated with particulate matter. Volatile organomercury compounds, such as dimethylmercury, and monomethylmercury salts, are also present in the atmosphere (Manahan, 1990). Mercury in the environment is deposited and revolatilized many times, with a residence time in the atmosphere of at least a few days. Atmospheric mercury can be deposited by both dry and wet deposition (Manahan, 1990). In the volatile phase, mercury can be transported hundreds of kilometers.

Most inorganic compounds of mercury are relatively insoluble. In aquatic environments, mercury binds strongly to dissolved matter or fine particulates. Mercury can be desorbed from sediment into the water column. Desorbed mercury in the water column can be transported when bound or chelated to fine particles or dissolved substances. Bryan and Langston (1992) report that the dominant process controlling the distribution of mercury compounds in the environment appears to be this sorption of nonvolatile forms to soil and sediment, with little re-suspension from the sediments back into the surface water.

Mercury concentrations in water and in fish tissue result from the formation of soluble monomethylmercury ion and volatile dimethylmercury by anaerobic bacteria in sediments. Water and sediment in which anaerobic decay is occurring likely contain all necessary conditions for methylation. Dimethylmercury and monomethylmercury become concentrated in fatty tissues of fish and other organisms (Manahan, 1990). Concentrations in tissue may be as much as 100,000 times the concentrations in water.

Although mercury in the surface soil can volatilize and maintain a residence time for a few days, ultimately being deposited far away from the site, mercury concentrations in the soil and sediment correlate more with mercury transported overland. Mercury detections in the surface soil ranged from 0.02 mg/kg to 11 mg/kg. The elevated mercury concentrations (i.e., concentrations above 1 mg/kg) were all located in Zone A, almost in a direct downward path starting the top (grade) of Zone A, starting at IS28SO13. The highest concentration of mercury (11.2 mg/kg) was located on the downgradient side at IS28SO15,

suggesting overland flow and a pooling affect that is evidence by the contours of the site (refer to Figures 2-4 and 4-2). IS28SO15 was the only sample location at the site where the mercury concentration exceeded the general mercury SSL of 8.82 mg/kg. Mercury was detected in the dissolved phase at one DPT groundwater location, IS28MM11 (but was not detected in the surface or subsurface soil at this location). IS28MM11 is located downgradient from the highest mercury detection (in the surface soil at IS28SO15).

5.2.2.6 Zinc

Zinc was detected in all media at Site 28 and exceeded its representative background concentrations in surface and subsurface soil. Zinc contributed to both human and ecological risk in multiple media.

Zinc occurs naturally as minerals with an average concentration in the earth's crust at approximately 40 mg/kg (Spectrum, 2004). It complexes most commonly as a sulfide, carbonate, silicate, and oxide (Bodek et al., 1988). The solubility of zinc is strongly affected by pH, ORP, temperature, and the presence of complexing ligands, competing ions, and precipitating reagents (Bodek et al., 1988). In the absence of strong sorbing material, zinc is readily transported in most natural waters. In oxidizing waters (e.g., Site 28), precipitation of zinc hydroxide, zinc carbonate, and zinc hydroxysulfate can occur when zinc is present in high dissolved concentrations (USEPA, 1980b)

Zinc compounds are not expected to volatilize based upon their ionic character and low vapor pressures of the non-ionizing compounds. Particulate-phase zinc will be removed from the atmosphere by wet and dry deposition.

The soil-water distribution coefficient for zinc ranges from less than 1 to 8,000 (refer to Tables 5-3 and 5-4), indicating that zinc compounds have a range of mobilities in soil, suspended solids, and sediment. Thus, zinc-contaminated sediments may become a source of dissolved zinc to overlying waters due to the remobilization of zinc from particulate to dissolved phases. There is an inverse correlation between sediment grain size and the concentration of zinc sorbed, meaning that smaller particles adsorb more zinc (Bodek et al., 1988). The same would be true of soil water infiltrating past zinc-contaminated soil.

Zinc concentrations were above the general zinc SSL of 13,622 mg/kg in surface and subsurface soil samples. In addition, zinc was detected at elevated concentrations in groundwater, suggesting that the surface and subsurface soils at Site 28 contribute to zinc groundwater contamination at Site 28. Zinc contamination was evident in both surface water and sediment at the site. This could be a result of both overland transport and groundwater transport to surface water, sediment, and Mattawoman Creek. The high concentrations of zinc starting at the center of Zone A (refer to Figures 4-6 and 4-7) suggest that this is the source area for zinc.

5.3 References

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USEPA, 2003. *USEPA Region III Risk-Based Concentration Table.* USEPA Region III, October.

Table 5-1
Representative Contaminants
Site 28 RI Report, NDWIH
Indian Head, Maryland

Semivolatile Organic Compounds
Bis(2-ethylhexyl)phthalate
Inorganics
Arsenic
Chromium
Lead
Mercury
Zinc

Table 5-2
Leaching-Based Soil Screening Levels for Representative Contaminants
Site 28 RI Report, NDWIH, Indian Head, Maryland

Constituent	Soil Screening Level [1] (DAF =20)
Semivolatile Organic Compound (µg/kg)	
Bis(2-ethylhexyl)phthalate	2,889
Metals (mg/kg)	
Arsenic	0.026
Chromium IV	42
Lead [2]	400
Mercury	8.82
Zinc	13,622

Notes and Abbreviations

µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
SSL = Soil Screening Level
RBC = Risk-Based Concentration
DAF = Dilution Attenuation Factor

[1] SSLs (DAF=20) from USEPA Region III RBC Table, October 2003. Mercuric chloride was used as a surrogate for mercury.

[2] SSL for lead is 400 ppm, based on USEPA OSWER Directives from 1994 and 1998:
- USEPA 1994. OSWER Directive: Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. USEPA August 1994, EPA/540/F-94/043 [OSWER Directive # 9355.4-12].
- USEPA 1998. OSWER Directive: Clarification to the 1994 Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. USEPA August 1998, EPA/540/F-98/030 [OSWER Directive #9200.4-27P].

Table 5-3
Retardation Coefficients for Representative Contaminants
Site 28 RI Report, NDWIH, Indian Head, Maryland

Chemical Group	Log K_{oc} (mg/g)	K_d (ml/g)	Retardation Coefficient (sand) (unitless)	Retardation Coefficient (clay) (unitless)
Semivolatile				
Bis(2-ethylhexyl)phthalate	5.05	4,084	24,506	11,845
Inorganics				
Arsenic	--	1 - 8.3	7 - 51	4 - 25
Chromium IV		16.8 - 360	102 - 2,161	50 - 1,045
Lead	--	Not available	Not available	Not available
Mercury	--	322 - 5,280	1,933 - 31,681	935 - 15,313
Zinc	--	0.1 - 8,000	2 - 48,001	1 - 23,201

Notes and Abbreviations

K_{oc} = Organic carbon partition coefficient

K_d = Distribution coefficient

R = Retardation coefficient = $1 + K_d \times p_b / n_e$

p_b = Soil bulk density = 1.5 grams per cubic centimeter for sand (USEPA, 1999)
= 1.45 grams per cubic centimeter for clay at Site 28 (measured)

n_e = Effective porosity = 0.25 for sand (Fetter, 2001)
= 0.50 for clay (Fetter, 2001)

For organics, $K_d = K_{oc}$ x fraction of organic carbon, estimated to be 0.0364 based on site-specific subsurface-soil data

Table 5-4
Physical, Chemical, and Half-Life Data of Representative Contaminants
Site 28 RI Report, NDWIH, Indian Head, Maryland

Chemical	Molecular Weight (g/mol)	Specific Gravity (unitless)	Water Solubility (mg/l)	Vapor Pressure (mm Hg)	Henry's Law Constant (atm-m^3/mol)	Henry's Law Constant (unitless)	K_d [1] (ml/g)	Log K_{oc} [1] (mg/g)	Log K_{ow} (ml/g)	Half-Life Range (days)					
										Soil		Groundwater		Surface Water	
										Low	High	Low	High	Low	High
Semivolatile															
Bis(2-ethylhexyl)phthalate	390.54 (2)	0.986 (2)	0.34 (3)	1.42E-07 (4)	1.02E-07 (3)	4.18E-06 (3)	--	5.05 (3)	7.30 (3)	5 (1)	23 (1)	10 (1)	389 (1)	5 (1)	23 (1)
Inorganics															
Arsenic	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain	1 - 8.3 (3)	--	Uncertain	*Inorganics do not degrade*					
Chromium IV	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain	16.8 - 360 (3)	--	Uncertain	*Inorganics do not degrade*					
Lead	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain	Not Available	--	Uncertain	*Inorganics do not degrade*					
Mercury	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain	322 - 5,280 (3)	--	Uncertain	*Inorganics do not degrade*					
Zinc	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain	Uncertain	0.1 - 8,000 (3)	--	Uncertain	*Inorganics do not degrade*					

Notes and Abbreviations

[1] K_d for inorganics and log K_{oc} for organics; K_d = Distribution coefficient; K_{oc} = Organic carbon partition coefficient; K_{ow} = Octanol-water partition coefficient

Uncertain = No value is provided because of the uncertainty in the form of this chemical in the environment. Properties are "affected by numerous geochemcial parameters and processes, including pH; sorption to clays, organic matter, iron oxides, and other soil constituents; oxidation/reduction conditions; major ion chemistry, and the chemical form of the metal (USEPA, 1996)."

Data sources:

(1) Howard, Ph. H. et al. 1991. Handbook of Environmental Degradation Rates.

(2) Spectrum Website. 2004. http://www.speclab.com/compound/

(3) USEPA. 1996. Soil Screening Guidance: Technical Background Document. May 1996, EPA/540/R95/128.

SECTION 6

Baseline Human Health Risk Assessment

6.1 Executive Summary

The following receptors had total reasonable maximum exposure (RME) noncarcinogenic hazards or carcinogenic risks that exceeded USEPA's target levels:

- Future adult resident exposed to groundwater
- Future child resident exposed to groundwater
- Future lifetime resident exposed to groundwater
- Future adult resident exposed to soil
- Future child resident exposed to soil
- Future lifetime resident exposed to soil
- Future construction worker exposed to groundwater
- Future construction workers exposed to soil

This section presents the results of an assessment of potential human health risks associated with the presence of site-related soil, surface water, sediment, and groundwater at Site 28 at NDWIH. The baseline risk assessment, which characterizes the human health risks at Site 28 if no additional remediation is implemented, was conducted to assess the potential human health impacts from the site under current conditions, as well as to determine if any further actions are needed at the site to be sufficiently protective of human health. This risk assessment has been prepared utilizing conservative assumptions, and all feasible exposure pathways have been considered based on current site conditions and current and potential future site usage.

The results of the Site 28 baseline human health risk assessment (HHRA) will be used to document the potential for endangerment to human health, to assist in identifying media that may need to be addressed through remedial action, and to provide a basis to select action levels.

6.2 Scope of Risk Assessment

The HHRA for Site 28 is comprises the following components:

- **Identification of Chemicals of Potential Concern (COPCs)** – identifies and characterizes the distribution of COPCs found on the site. COPCs are the focus of the subsequent evaluation in the risk assessment.
- **Exposure Assessment** – identifies contaminated media and potential pathways by which exposure could occur, characterizes the potentially exposed populations (e.g., residents), and estimates the magnitude, frequency, and duration of exposures.

- **Toxicity Assessment**—identifies the types of adverse health effects associated with exposure to COPCs and summarizes the relationship between magnitude of exposure and occurrence of adverse health effects (toxicity factors).
- **Risk Characterization**—integrates the results of the exposure assessment and toxicity assessment to estimate the potential risks to human health. Both cancer and noncancer human health effects are evaluated. Pathways that pose an unacceptable risk are identified.
- **Uncertainty Assessment**—identifies sources of uncertainty associated with the data, methodology, and the values used in the risk assessment.

These components are described in the following sections. The spreadsheets used to screen for COPCs, and calculate estimated exposures and health risks associated with the COPCs, are presented in Appendix G.

6.3 Identification of Chemicals of Potential Concern

The identification of COPCs includes data collection, data evaluation, and data screening steps. The data collection and evaluation steps involve gathering and reviewing the available site data and identifying a set of data that is of acceptable quality for the risk assessment. This data set is then further screened against concentrations that are protective of human health to reduce the data set to those chemicals and media of potential concern.

6.3.1 Data Selection and Evaluation

Section 1.4 summarizes the previous investigations at Site 28.

There are few site historical data, most of which are several years old. Data collected during the RI were evaluated in the risk assessment. Only analytical results that were fully validated were used in the human health risk assessment. The following bullets discuss how validated, qualified results were evaluated in the risk assessment:

- Data qualified with a J (estimated) were treated as detected concentrations.
- Data qualified with an R (rejected) were excluded from the risk assessment.
- Data qualified with a B (blank contamination) was used in the risk assessment as if they were not detected, and one-half the value was used as the sample concentration.
- For duplicate samples, the higher of the two concentrations was used.
- One-half the sample quantitation limit (SQL), also referred to as the method reporting limit, was used in place of undetected results in calculating summary statistics for analytes having one or more positive results in a particular medium.
- Analytes for which no positive results are reported for a particular medium were not considered COPCs for that medium.

6.3.2 Data Summary

All of the data used in the risk assessment have been fully validated and are assumed to represent current conditions. Soil, surface water, and groundwater data that were used in the risk assessment are presented in this section. There is also a discussion on sediment data; however, as discussed in Section 6.3, exposure to sediment was not quantified in the risk

assessment. For each medium, chemical-specific summary statistics are presented in Appendix F for the data set used for risk calculations. Methods for calculating exposure point concentrations and 95 percent UCL values for the COPCs are discussed in Section 6.3.3.

6.3.2.1 Soil

During the RI, surface soil samples were collected from 0 to 6 in. bgs, and subsurface soil samples were collected from 1 to 3 ft bgs at 27 locations in Zone A and eight locations in Zone B (see Figure 2-1). A Geoprobe was used at locations accessible by a track mounted Geoprobe, at other locations a hand Geoprobe was utilized.

The soil samples were analyzed for TCL VOCs, TCL SVOCs, TAL metals, and chemicals used in the manufacturing of explosives: the SW-846 method 8330 list of nitroaromatics and nitroamines, NG, NQ, PETN, and perchlorate.

Table 6-1 summarizes each sample and the corresponding analysis. Analytical results for the soil samples are summarized in Tables 4-1, 4-2, 4-3, and 4-4 and Appendix C.

6.3.2.2 Groundwater

Five monitoring wells were installed in August 2003 and sampled in September 2003. The monitoring well locations were selected based on the results of direct push groundwater sample results collected in May 2003. Following standard USEPA risk assessment practice, the Geoprobe groundwater samples were not evaluated in the risk assessment. These samples are typically very turbid and not necessarily representative of actual groundwater concentrations. Groundwater samples collected from the monitoring wells were analyzed for TCL VOCs, TCL SVOCs, TAL metals, and chemicals used in the manufacturing of explosives.

Following USEPA Region III guidance (USEPA, 1992), dissolved inorganic groundwater data were used for the residential exposure scenario. Total inorganic groundwater data were used for the construction worker scenario because the construction worker would be exposed directly to the groundwater water in the excavation pit.

Figure 4-7 identifies the locations of the Site 28 monitoring wells. Table 6-1 summarizes the groundwater samples evaluated in the risk assessment and the corresponding laboratory analysis. Analytical results for the groundwater samples are summarized in Table 4-7 and Appendix C.

6.3.2.3 Surface Water

Three surface water samples were collected from the swales during the RI. Surface water samples were analyzed for TCL VOCs, TCL SVOCs, chemicals used in the manufacturing of explosives, and TAL metals (total and dissolved).

Figure 4-8 identifies the surface water sample locations. Table 6-1 summarizes the surface water samples evaluated in the risk assessment and the corresponding laboratory analysis. Analytical results for the surface water samples are presented in Table 4-9, and Appendix C.

6.3.2.4 Sediment

Exposure to sediment was not quantitatively evaluated in the risk assessment. As discussed in Section 6.3.2, exposure to sediment is not a complete exposure pathway. However, a brief discussion of the sediment data is included here.

High zinc concentrations were detected in sediment collected from Mattawoman Creek during the TIE and Mattawoman Creek study. Human health risks associated with exposure to sediment were evaluated in the Mattawoman Creek study (Tetra Tech NUS, 2002). The Mattawoman Creek study considered risk for current/future construction workers, adult recreational users, and adolescent recreational users. The study concluded the following:

> Incremental cancer risks and hazard indices for exposure to sediment and surface water by construction workers, adolescent recreational users, and adult recreational users were within acceptable levels for the RME and CTE scenarios. The incremental cancer risk for the ingestion of fish by adolescent and adult recreational users exceeded EPA's target risk range of 10^{-4} and 10^{-6} for both the RME and CTE scenarios. Arsenic and Aroclor-1260 were the major contributors to the incremental cancer risk for ingestion of fish from Mattawoman Creek. The Hazard indices for ingestion of fish by adolescent and adult recreational users exceeded the acceptable level of 1. Arsenic, 2-amino-4,6-dinitrotoluene, and 4-methylphenol were the major contributors to the HI for the ingestion of fish from Mattawoman Creek. [Tetra Tech NUS, 2002a, pp. 6-34-6-35.]

Zinc was not a primary risk driver for the Mattawoman Creek study, but at localized areas of Mattawoman Creek (such as the zinc recovery furnace) zinc was detected as high as 71,000 mg/kg.

For the Site 28 RI, 15 sediment samples were collected at depth intervals of 0–6 in. and 6–12 in. Three of these samples were collected from the swale, and the remaining twelve samples were collected from Mattawoman Creek. All locations were sampled for TAL metals; three locations were also sampled for TCL SVOCs and chemicals used in the manufacturing of explosives. However, as mentioned above, this data was not evaluated in the human health risk assessment.

6.3.3 Selection of Chemicals of Potential Concern

All of the detected constituents were screened to select the COPCs in accordance with USEPA Region III guidelines (USEPA, 1993), using the steps described below. The COPC selection process was conservative to ensure selection of the constituents comprising the majority of the potential risk associated with the site. The maximum detected concentration of each constituent in each medium was compared to a screening value to select the COPCs for the media. If the maximum concentration exceeded the screening value, the constituent was selected as a COPC and retained for the risk evaluation. The only variance from this COPC selection procedure applied to lead. Due to the different approach adapted by USEPA for estimating potential health risks posed by exposure to environmental lead, the mean lead concentrations were compared to the appropriate lead screening levels.

- **Comparison with Health-based Criteria for Soil:** The maximum detected chemical concentrations in soil were compared with USEPA Region III risk-based concentrations (RBCs) for residential soil (USEPA, 2003a). RBCs that are based on noncarcinogenic effects were divided by 10 to account for exposure to multiple constituents. RBCs based

on carcinogenic effects were used as presented in the RBC table. Mean lead soil concentrations were compared to the USEPA residential child soil screening value of 400 ppm (OSWER Directive 9355.4-12, issued on July 14, 1994).

- **Comparison with Health-based Criteria for Air:** The maximum detected air concentrations calculated from soil were compared with USEPA Region III ambient air RBCs (USEPA, 2003a). RBCs that are based on noncarcinogenic effects were divided by 10 to account for exposure to multiple constituents. RBCs based on carcinogenic effects were used as presented in the RBC table (USEPA, 2003a). Air concentrations were estimated on the basis of the maximum detected soil concentrations using USEPA methodology (USEPA, 1996).

- **Comparison with Health-based Criteria for Groundwater:** The maximum detected chemical concentrations in groundwater were compared with USEPA Region III tap water RBCs (USEPA, 2003a). RBCs that are based on noncarcinogenic effects were divided by 10 to account for exposure to multiple constituents. RBCs based on carcinogenic effects were used as presented in the RBC table. The mean lead groundwater concentration was compared to the Safe Drinking Water Act lead action level of 15 parts per billion (ppb).

- **Comparison with Health-based Criteria for Surface Water:** RBC values are not available for surface water. In addition, tap water RBCs are based on exposure assumptions that are not applicable for contact with surface water. As such, screening of COPCs in surface water was based on a comparison of maximum detected surface water concentrations to 10 times the tap water RBCs. The use of 10 times the tap water RBC is a conservative estimate because a receptor is in contact with surface water at exposure parameters (ingestion rate, skin surface area, exposure frequency, and exposure duration) much lower than those for groundwater. Tap water RBCs that are based on noncarcinogenic effects were used as presented in the most current RBC table (USEPA, 2003a). USEPA Region III tap water RBCs based on carcinogenic effects were multiplied by 10 for surface water COPC screening. Lead concentrations in surface water were compared to the Safe Drinking Water Act action level for lead of 15 µg/L.

- **Comparison with Recommended Dietary Allowances (RDAs):** Chemicals that are human nutrients, present at low concentrations (i.e., only slightly elevated above naturally occurring levels), and toxic only at very high doses were eliminated from the quantitative risk analysis. These constituents are calcium, magnesium, potassium, and sodium.

6.3.4 Chemicals of Potential Concern

Table 6-2 identifies the chemicals that were selected as COPCs based on the above screening methodology for soil, surface water, and groundwater. Details of the screening process are shown in the screening tables, Tables 2.1 through 2.9, in Appendix G. The COPCs for soil are primarily PAHs and metals. Although lead was not selected as a COPC for surface soil or combined surface and subsurface soil based on a comparison of the mean lead concentration to the screening value, it was retained as a COPC because the lead concentrations within the central area of the site are much higher than the concentrations across the remainder of the site, and are above the lead screening level. This is discussed in Section 6.4.3. There were no COPCs retained for inhalation of volatile and fugitive emissions from surface soil or combined surface and subsurface soil, and therefore, this pathway was not quantified in the risk assessment. The COPCs for the surface water are two metals, arsenic and lead. The COPCs for groundwater are metals and one SVOC, bis(2-ethylhexyl)phthalate.

6.4 Exposure Assessment

Exposure refers to the potential contact of an individual with a chemical. The exposure assessment identifies pathways and routes by which an individual may be exposed to the COPCs and estimates the magnitude, frequency, and duration of potential exposure. Contaminant fate and transport is evaluated in Section 5, which discusses the potential release mechanisms at the site. A conceptual exposure model showing potential exposure scenarios identified under current and potential future conditions is presented in Figure 6-1. The following subsections discuss the three components of exposure assessment:

- Characterization of exposure setting
- Identification of exposure pathways
- Quantification of exposure

6.4.1 Characterization of Exposure Setting

Characterizing an exposure setting consists of two parts: (1) identifying the physical characteristics of the site as they relate to exposure, and (2) characterizing human populations on or near the site.

Basic facility characteristics such as physical setting, climate, groundwater hydrology, and the presence and location of surface water were summarized in Section 2.

Potentially exposed populations are identified based on their locations relative to the site, their activity patterns, and the presence of potentially sensitive subpopulations. Table 6-3 summarizes the potentially exposed populations evaluated in this risk assessment.

6.4.1.1 Current Land Use

Currently, Site 28 is not used, and vehicle access to the site is restricted. Utility workers may repair and maintain the fence that surrounds the site and be exposed to surface and subsurface soil. Although in some locations at the site, the groundwater is close to the ground surface, the utility workers would not be expected to be working in these areas and would most likely not contact the shallow groundwater. Although the site is mostly fenced,

it may be possible for adult and adolescent trespassers to access the site and be exposed to surface soil.

Mattawoman Creek is used for boating and fishing, and therefore, recreational users may be exposed to Mattawoman Creek surface water adjacent to Site 28. The surface water data collected from the swales was conservatively assumed to represent the potential surface water concentrations in Mattawoman Creek associated with Site 28. The banks of Mattawoman Creek adjacent to Site 28 are very steep, and therefore, any sediment contacted by the recreational user would be rinsed off the skin while exiting the creek to land or re-entering a boat. Additionally, the swales are very small, and exposure to sediment in the swales would be expected to be insignificant. Therefore, exposure to sediment was not quantified in the risk assessment. The fisherman and their families may ingest the fish that they catch from the creek. However, fish tissue samples were not collected from Mattawoman Creek for this study and this pathway was evaluated qualitatively. As noted above, fish consumption was identified as a human health risk in the Mattawoman Creek Study performed by Tetra Tech NUS (2002). This study assessed the creek as a whole.

There is no current exposure to groundwater beneath Site 28. Groundwater is not currently used as a water supply for potable or other uses at NDWIH.

6.4.1.2 Potential Future Land Use

Site 28 is located in an area of the facility that could potentially be used recreationally (e.g., for fishing) but would not likely be used for residential, commercial[2], or industrial purposes. The future recreational user could be exposed to surface water while fishing or boating in the creek, the same exposures that are considered for the current recreational user. Swimming is not likely to take place at the site. The shoreline is overgrown for all of Zone B, and the creek itself is mostly wetland vegetation for the first 50 ft off the shore.

The potential future uses of the site assume that the subsurface soil will be excavated and placed on the ground surface. Therefore, future exposure to soil includes exposure to combined surface and subsurface soil. It was assumed a future trespasser (adult and adolescent) might be exposed to this soil. Although unlikely, it was assumed the site could be used for future residential development, and future residents could contact site surface and subsurface soil. Excavation activities at the site may also expose the construction worker to the soil.

Groundwater is not anticipated to be used as a future potable water supply at the base. However, the groundwater data from the site was used as a conservative assessment of groundwater quality for the future residential exposure scenario. The construction worker may also be exposed to the shallow groundwater during the excavation/construction activities.

6.4.2 Identification of Exposure Pathways

An exposure pathway can be described as a mechanism that moves a COPC from its source to an exposed population or individual, referred to as a receptor. An exposure pathway

[2] The commercial and industrial worker exposure routes were not evaluated quantitatively in this risk assessment because the residential evaluation should provide a conservative upper-bound estimate of risk for these receptors.

must be complete or exposure cannot occur. A complete exposure pathway has five elements:

- Source (e.g., chemical residues in soil)
- Mechanism for release and migration of chemical (e.g., runoff, leaching)
- Environmental transport medium (e.g., soil, surface water)
- Point or site of potential human contact (exposure point, e.g., contact with soil)
- Route of intake (e.g., incidental ingestion of soil)

All five elements must be present for a pathway to be considered complete. If one or more elements are not present, then the pathway is incomplete and there is no possibility of exposure. The following subsections discuss the elements as they pertain to Site 28.

6.4.2.1 Contaminant Sources

Sources at Site 28 include contaminated soil associated with the former zinc recovery furnace and the shoreline burning cage. The constituents detected in site media are primarily SVOCs and metals.

6.4.2.2 Release and Transport Mechanisms

The fate and transport of chemicals in surface soil, soil (combined surface and subsurface soil), groundwater, surface water, and sediment are determined by physical characteristics of the site as well as by the chemical and physical properties of the constituents. A detailed description of the fate and transport of contaminants is presented in Section 5 of this report.

The primary transport mechanisms from sources at Site 28 appear to be fugitive dust and volatile emissions from soil, leaching from soil to groundwater, and surface erosion caused by runoff to the river. Carbon tetrachloride is believed to be coming from upgradient of the site.

6.4.2.3 Potential Exposure Points and Exposure Routes

Exposure points are locations where humans could come in contact with contamination. On-site exposure points include surface soil, soil (combined surface and subsurface soil), surface water, and groundwater.

Potential exposure routes are evaluated for potential current and future site use. Existing and potential exposure pathways are illustrated in the conceptual exposure model (Figure 6-1). Exposure scenarios and potentially complete pathways of exposure evaluated in this risk assessment are presented in Table 6-3.

6.4.2.4 Current Exposure Routes

The only contaminated media currently accessible at the site are surface soil, combined surface and subsurface soil, and surface water. Based on current site use, potential receptors at the site are utility workers (combined surface and subsurface soil exposure), adult and adolescent trespassers (surface soil), and adult and adolescent recreational users (surface water, fish). Table 6-3 identifies the current exposure routes for each of these receptors.

6.4.2.5 Future Exposure Routes

The probable future use of the site is the same as the current use. In that case, the most likely future receptors would be utility workers (soil), adult and adolescent trespassers (soil), and adult and adolescent recreational users (surface water). The potential future exposure scenario assumes that the subsurface soil will be excavated and become surface soil. Additionally, a future residential child and adult scenario (soil and groundwater) was conservatively included in this evaluation to account for an unrestricted use scenario. Table 6-3 identifies the potential future exposure routes for each of these receptors.

The exposure pathways listed above were selected in consultation with USEPA Region III and the Navy. The exposure concentrations used to calculate potential risks to each of the receptors are presented in Appendix G, Tables 3.1 through 3.5 (RME and central tendency exposure (CTE)). The exposure parameters and equations used to calculate the risks are presented in Appendix G, Tables 4.1 through 4.9 (RME and CTE).

6.4.3 Quantification of Exposure

Exposure is quantified by estimating the exposure point concentrations and chemical intake by the receptors for both RME and CTE scenarios.

6.4.3.1 Exposure Point Concentrations (EPCs)

Exposure point concentrations are estimated chemical concentrations that a receptor may contact and are specific to each exposure medium. Exposure point concentrations may be directly monitored or estimated using environmental fate and transport models. For this assessment, fate and transport modeling was used to estimate constituent concentrations in fugitive dust emissions from soils.

Fugitive dust and volatile emissions from soil were estimated as part of the COPC screening process (Appendix G, Tables 2.2, 2.2.A, 2.4, 2.4.A, and 2.7) following USEPA's Soil Screening Guidance Document (USEPA, 1996). There were no COPCs retained for inhalation of volatile and fugitive emissions from surface soil or combined surface and subsurface soil, and therefore, the inhalation pathway was not quantified in this risk assessment.

The RME EPCs were calculated as the 95 percent upper confidence limit (95 percent UCL), the 97.5 percent UCL, or the 99 percent UCL of the arithmetic mean concentration. The maximum detected concentration was used in place of the UCL as the EPC when the calculated UCL was greater than the maximum detected value or less than five samples were available for the data grouping.

ProUCL, version 2.1 (USEPA, 2003c), was used to calculate the UCLs and determine the distribution the data fit. The ProUCL model uses the Shapiro-Wilk W-test to determine if the data fit a lognormal or normal distribution for data sets with less than 50 samples. For data sets with greater than 50 samples, Lilliefors test was used to determine the distribution of the data. The distribution that the data fit was then used to choose the method that ProUCL uses to calculate the UCL. The recommendations outlined in the ProUCL model documentation were used to select the appropriate UCL. For data that were determined to fit a normal distribution, the student's t-statistic was used to calculate the 95 percent UCL. For data determined to fit a lognormal distribution, either Land's H-statistic was used to calculate the 95 percent UCL, or the Chebyshev Theorem using the MVUE of the parameters

was used to calculate the 95 percent UCL, 97.5 percent UCL, or 99 percent UCL, depending on the standard deviation of the population. For data that fit neither a lognormal or normal distribution, the Chebyshev Theorem using the arithmetic mean and standard deviation was used to calculate the 95 percent UCL, 97.5 percent UCL, or 99 percent UCL, depending on the population standard deviation. For data sets that fit both a lognormal and normal distribution, the methods described above for the distribution with the higher W-value was used to calculate the UCL.

The average concentration was used as the CTE EPCs. For data that fit a lognormal distribution (based on the discussion above), the average of the log-transformed data was used as the CTE EPC. For data that fit a normal distribution, the average of the nontransformed data was used as the CTE EPC. For data sets that fit both lognormal and normal distributions or fit neither, the distribution with the higher W-value was used to calculate the UCL.

Due to the limited number of surface water samples that were collected, UCLs were not calculated for this media. The maximum detected concentrations were selected as the RME EPCs for the surface water COPCs.

The data qualifiers were handled as discussed in Section 6.3.1, to calculate the RME and CTE EPCs. The RME EPCs are included in Appendix G, Tables 3.1.RME through 3.5.RME and the CTE EPCs are included in Appendix G, Tables 3.1.CTE through 3.5.CTE.

The filtered inorganic data were used to evaluate the residential scenario following USEPA guidance (USEPA, 1992). Unfiltered inorganic data were used to evaluate the construction worker scenario.

6.4.3.2 Estimation of Chemical Intakes for Individual Pathways

Chemical intake is the amount of a chemical contaminant entering the receptor's body. Chemical intakes are generally expressed as follows:

$$I = \frac{C \times CR \times EF \times ED}{BW \times AT} \quad (mg/kg/day)$$

Where:

I = intake (mg/kg-day)

C = chemical concentration at exposure point (mg/L, mg/kg, mg/m^3)

CR= contact rate, or amount of contaminated medium contacted per unit time or event (L/day, mg/event, m^3/day)

EF= exposure frequency (days/year)

ED= exposure duration (years)

BW= body weight of exposed individual (kg)

AT= averaging time, or period over which exposure is averaged (days)

The intake equation requires specific exposure parameters for each exposure pathway. Appendix G, Tables 4.1 through 4.9 (RME and CTE) present the exposure factors used for

different scenarios at the site. Both RME and CTE intakes were included in this evaluation. CTE intakes were calculated for exposure scenarios with RME cumulative cancer risks greater than 1×10^{-4} or cumulative noncancer hazards greater than 1.

For residential exposure to soil and groundwater, lifetime age-adjusted intakes were calculated for carcinogenic constituents. Age-adjusted exposure factors were calculated using the equations presented in the USEPA Region III RBC table (USEPA, 2003a) and shown in Tables 4.6 and 4.8 (RME and CTE) in Appendix G.

A dermal absorption factor is required for the dermal exposure to soil pathway. Dermal absorption factors were obtained from USEPA's RAGS, Part E (USEPA, 2001, Exhibit 3-4). For the inorganic constituents not included in this reference, one percent was used as the default value (USEPA, 1995).

The methods presented in USEPA's RAGS, Part E (USEPA, 2001), for estimating dermal exposure to water were used to evaluate dermal exposure to groundwater during bathing and showering, dermal exposure to groundwater in an open excavation, and dermal exposure to surface water in Mattawoman Creek. The non-steady state model or pseudo steady-state model was used to estimate the dermally absorbed dose per event for organic constituents (USEPA, 2001). If the exposure time (or event time, t_{event}) was shorter than the time to reach steady-state (t^*), the non-steady-state model was used. If t_{event} was greater than t^*, the pseudo-steady state model was used. For inorganics, the absorbed dose was calculated using a steady-state approach. These models are shown in Tables 4.5 (RME and CTE) and 4.8 (RME and CTE), in Appendix G.

6.5 Toxicity Assessment

Toxicity assessment defines the relationship between the magnitude of exposure and possible severity of adverse effects, and weighs the quality of available toxicological evidence. Toxicity assessment generally consists of two steps: hazard identification and dose-response assessment. Hazard identification is the process of determining the potential adverse effects from exposure to the chemical along with the type of health effect involved. Dose-response assessment is the process of quantitatively evaluating the toxicity information and characterizing the relationship between the dose of the contaminant administered or received and the incidence of adverse health effects in the exposed population. Toxicity criteria (e.g., reference doses and slope factors) are derived from the dose-response relationship. USEPA has performed the toxicity assessment step for many chemicals and has published the results in IRIS, NCEA issue papers, and HEAST databases.

Health effects are divided into two broad groups: noncarcinogenic and carcinogenic effects. This division is based on the different mechanisms of action currently associated with each category. Chemicals causing noncarcinogenic health effects are evaluated independently from those having carcinogenic effects. Some chemicals may produce both noncarcinogenic and carcinogenic effects, and are therefore evaluated in both groups.

The primary source of toxicity values is the USEPA's IRIS database, which contains up-to-date health risk and USEPA regulatory information. IRIS includes only RfDs and CSFs that have been verified by USEPA work-groups. The IRIS database is the USEPA's preferred

source of toxicity information. If data were not available from IRIS, data from NCEA were used. If data were not available from either of these sources, HEAST, which are issued by USEPA's Office of Research and Development, were consulted. If no appropriate toxicity values were available, an appropriate surrogate constituent was selected for the COPC screening, or the chemical was evaluated qualitatively.

6.5.1 Toxicity Information for Noncarcinogenic Effects

Noncarcinogenic health effects include a variety of toxic effects on body systems, ranging from renal toxicity (toxicity to the kidneys) to central nervous system disorders. Noncarcinogenic health effects are grouped into two basic categories: acute toxicity and chronic toxicity. Acute toxicity can occur after a single exposure (usually at high doses), and the effect is most often seen immediately. Chronic toxicity generally occurs after repeated exposure (usually at low doses) and is seen weeks, months, or years after the initial exposure. The toxicity of a chemical is assessed through a review of toxic effects noted in short-term (acute) animal studies, long-term (chronic) animal studies, and epidemiological investigations.

USEPA (1989) defines the chronic RfD as a dose that is likely to be without appreciable risk of deleterious effects during a lifetime of exposure. Chronic RfDs are specifically developed to be protective for long-term exposure to a compound (for example, 7 years to a lifetime), and consider uncertainty in the toxicological data base and sensitive receptors. Chronic RfDs may be overly protective if used to evaluate the potential for adverse health effects resulting from short-term exposure. USEPA's NCEA develops subchronic RfDs for short-term exposure (2 weeks to 7 years). Subchronic RfDs have been peer-reviewed by Agency and outside reviewers, but they have not undergone verification by an intra-Agency workgroup, and as a result are considered interim rather than verified toxicity values. Chronic and subchronic RfDs are developed for both the inhalation and oral exposures. Subchronic RfDs were used for the construction worker scenario because the exposure duration is 1 year.

In the development of RfDs, all available studies examining the toxicity of a chemical following exposure are considered based on their scientific merit. The lowest dose level at which an observed toxic effect is occurring is identified as the "lowest-observed-adverse-effect level" (LOAEL) and the dose at which no effect is observed is identified as the "no-observed-adverse-effect level" (NOAEL). Several uncertainty factors (UFs) may be applied to account for uncertainty. UFs account for uncertainties such as poor data quality, extrapolation of data from animal studies to human exposures, or the use of subchronic studies to develop chronic criteria. These UFs range between 10 to 10,000, and are based on professional judgment. Therefore, there are varying degrees of uncertainty in the toxicity criteria.

USEPA-derived oral and inhalation RfDs, and associated UFs and MFs for the COPCs at Site 28 are listed in Tables 5.1 and 5.2 in Appendix G.

Per USEPA guidance, oral RfDs were adjusted from administered doses to absorbed doses for evaluating dermal toxicity, when deemed appropriate. The RfDs were adjusted using oral absorption factors from USEPA (2001). The adjusted dermal RfDs are summarized in Table 5.1 in Appendix G.

6.5.2 Toxicity Information for Carcinogenic Effects

Potential carcinogenic effects are quantified using oral and inhalation CSFs. CSFs are expressed in units of per milligram per kilogram of body weight per day $(mg/kg/day)^{-1}$.

CSFs may be derived from the results of chronic animal bioassays, human epidemiological studies, or both. Animal bioassays are usually conducted at dose levels that are much higher than are likely to be encountered in the environment. This study design detects possible adverse effects in the relatively small test populations used in the studies.

A number of mathematical models and procedures have been developed to extrapolate from the high doses used in laboratory studies to the low doses typically associated with environmental exposures. The USEPA-preferred linearized multistage (LMS) model is usually used to estimate the largest linear slope (within the upper 95 percent UCL) at low extrapolated doses that is consistent with the data. The 95 percent UCL slope of the dose-response curve is subjected to various adjustments, and an inter-species scaling factor is usually applied to derive a cancer slope factor or inhalation unit risk factor for humans. It is assumed that if a cancer response occurs at the dose level in the study, there is some probability that a response will occur at all lower exposure levels (i.e., a dose-response relationship with no threshold is assumed). Dose-response data derived from human epidemiological studies are fitted to dose-time-response curves on an ad hoc basis. In both types of analyses, conservative (e.g., health protective) assumptions are applied and the models are believed to provide rough estimates of the upper limits on potential lifetime risk.

USEPA-derived oral and inhalation CSFs are listed in Tables 6.1 and 6.2 in Appendix G. In accordance with USEPA guidance, certain oral CSFs were adjusted from administered doses to absorbed doses to evaluate dermal toxicity. When appropriate, the CSFs were adjusted using oral absorption factors from USEPA (2001). The adjusted dermal CSFs are summarized in Table 6.1 in Appendix G.

6.5.3 Chemicals for Which no USEPA Toxicity Values Are Available

Most of the chemicals detected at the site have toxicity factors and USEPA Region III RBCs. Detected constituents that did not have RBCs were compared to RBCs for appropriate surrogate constituents. Surrogates were based on previous recommendations from USEPA Region III, and their RBCs were used to screen these constituents. The surrogates used are identified in the screening tables, Tables 2.1 through 2.9 in Appendix G.

Lead and mercury are the only constituents identified as COPCs that do not have toxicity values, and therefore, required other considerations for the risk characterization. For mercury, the analytical results for mercury in soil were for total mercury. However, mercury has three valence states and is found in the environment in the metallic form, and in the form of various inorganic and organic complexes. For the purposes of this HHRA, the oral RfD for mercuric chloride was used as a surrogate for elemental mercury.

Lead does not have available published toxicity factors. Lead is regulated by USEPA based on the concentration of lead in blood. The blood-lead concentration is estimated by using a physiologically based pharmacokinetic model (the Integrated Exposure Uptake Biokinetic (IEUBK) Model). As a conservative soil screening value, 400 mg/kg lead in soil was considered appropriate for residential land use scenarios (OSWER Directive 9355.4-12,

issued on July 14, 1994). Lead concentrations in groundwater and surface water were compared to the Safe Drinking Water Act action level of 15 µg/L.

The average site-wide concentrations of lead in surface soil (142 mg/kg) and combined surface and subsurface soil (58.5 mg/kg) were below the lead soil screening level of 400 mg/kg. Therefore, the site-wide lead concentrations were not evaluated further in the risk characterization. However, detected concentrations of lead in 12 of the 70 soil samples were above the soil screening value of 400 mg/kg, some of them greater than 25 times the soil screening value. These samples were collected near Swale 3 in Zone A, forming a relatively continuous geographic extent (Figure 6-2). An assessment of risk associated with exposure to lead in this limited area was performed using the results from those sample locations where the surface and/or subsurface soil sample results were detected above the soil screening value of 400 mg/kg (see Table 1 in Appendix H and Figure 6-2). An average soil lead concentration of 2,126 mg/kg was calculated for these samples and subsequently used as the lead exposure point concentration.

The IEUBK model was used to quantitatively assess the potential impacts of lead exposure to the residential child (see Appendix H). Risks associated with non-residential adult exposure to lead were evaluated based on *Recommendations of the Technical Review Workgroup for Lead for an Approach to Assessing Risks Associated with Adult Exposure to Lead in Soil* (USEPA, 2003d). This approach uses a methodology that relates soil lead intake to blood lead concentrations in women of child-bearing age. The methodology focuses on estimating fetal blood lead concentrations in women exposed to lead-contaminated soil.

The IEUBK evaluation predicted a geometric mean blood lead concentration of 15.8 micrograms per deciliter of blood (µg/dL) for children 0 to 84 months old, as a result of ingestion of soil from the Swale 3 area. This blood lead concentration exceeds the USEPA's target level of concern of 10 µg/dL. According to the IEUBK model, this represents approximately 83 percent of this population. Thus, exposure to soil in this area would be a potential concern for future child residents.

In general, the Adult Lead Model is intended to be used to determine blood lead levels for fetuses of industrial workers; however, it was used to determine risks for fetuses of the current utility worker, current and future adult trespasser, and future construction worker because no other model is available (see Appendix H). As a result, the ingestion rate and exposure frequency variables of the model input were adjusted to reflect each exposure population, which introduced an uncertainty into the lead risk estimations. Below is a discussion of the Adult Lead Model results for each of the exposure populations.

For the current utility worker, the model predicted a geometric mean blood lead concentration in the range of 2.8 to 3.0 µg/dL using an adjusted ingestion rate of 0.48 g/day and an exposure frequency of 10 days/year. The 95th percentile blood lead level for fetuses of the utility worker is predicted to be in the range of 8.7 µg/dL to 10.8 µg/dL, as a result of ingestion of soil from the Swale 3 area. These results are in the range of USEPA's recommended level of 10 µg/dL. The probability that the fetal lead blood concentration would be greater than the target blood lead concentration of 10 µg/dL ranges from less than to slightly greater than 5 percent. Therefore, exposure to lead in soil could be a potential health concern for the fetuses of pregnant female utility workers, if they are exposed at the upper end of the estimated range of parameter values.

For the future construction worker, the model predicted a geometric mean blood level concentration of approximately 35 µg/dL using an adjusted ingestion rate of 0.48 g/day and an exposure frequency of 250 days/year. The 95th percentile blood lead level for fetuses of the construction worker is predicted to be in the range of 107 µg/dL to 125 µg/dL, as a result of ingestion of soil from the Swale 3 area. These results exceed USEPA's recommended level of 10 µg/dL. The probability that the fetal lead blood concentration would be greater than the target blood lead concentration of 10 µg/dL is greater than 5 percent (the calculated probability is greater than 90 percent). Therefore, exposure to lead in soil would be a potential health concern for the fetuses of pregnant female construction workers.

For the adult trespasser (current and future), the model predicted a geometric mean blood level concentration in the range of 3.0 to 3.2 µg/dL using an adjusted ingestion rate of 0.1 g/day and an exposure frequency of 52 days/year. The predicted 95th percentile blood level for fetuses of the adult trespasser is in the range of 9.0 µg/dL to 11.2 µg/dL, as a result of ingestion of soil from the Swale 3 area. The results are in the range of USEPA's recommended level of 10 µg/dL. The probability that the fetal lead blood concentration would be greater than the target blood lead concentration of 10 µg/dL ranges from less than to slightly greater than 5 percent. Therefore, exposure to lead in soil could be potential health concern for the fetuses of adult trespassers, if they are exposed at the upper end of the estimated range of parameter values.

The one detected concentration (in three samples) of lead in the surface water (61.5 µg/L) slightly exceeded the Safe Drinking Water Act action level for lead of 15 µg/L. Exposure to lead in surface water by recreational users cannot be evaluated quantitatively. However, since recreational exposure is much less than drinking water exposure (the basis for the action level), exposure to lead in the surface water is not expected to be a concern for human health.

The maximum detected concentration (30 µg/L) and the average concentration (17.1 µg/L) of lead in unfiltered groundwater exceed the Safe Drinking Water Act action level for lead of 15 µg/L. Exposure to lead in groundwater by construction workers during excavation cannot be evaluated quantitatively. However, since construction worker exposure to groundwater is much less than drinking water exposure, exposure to lead in the groundwater by a construction worker is not expected to be a concern for human health.

The maximum detected concentration of lead in the filtered groundwater was below the Safe Drinking Water Act action level for lead of 15 µg/L, and therefore exposure to lead in drinking water is not expected to be a concern for future residents.

6.6 Risk Characterization

Risk characterization is the process of integrating the previous elements of the risk assessment into quantitative and semiquantitative expressions of risk. The calculated risk is then used as an integral component in remedial decision-making and selection of potential remedies or actions.

6.6.1 Noncarcinogenic and Carcinogenic Risk Estimation Methods

Potential human health risks are discussed independently for carcinogenic and noncarcinogenic contaminants because of the different toxicological endpoints, relevant exposure duration, and methods used to characterize risk. The noncarcinogenic health impacts from carcinogens are also assessed.

6.6.1.1 Noncarcinogenic Risk Estimation

Noncarcinogenic health risks are estimated by comparing actual or expected exposure levels to threshold concentrations (or RfDs). The expected intake divided by the RfD is equal to the hazard quotient (HQ):

$$\text{Hazard Quotient (HQ)} = \text{Intake} / \text{RfD}$$

The intake and RfD are expressed in the same units and represent the same exposure period (i.e., chronic or subchronic). The intake and RfD also represent the same exposure route, (i.e., inhalation intakes are divided by the inhalation RfD). When the HQ exceeds one (i.e., exposure exceeds the RfD), a certain degree of health risk is indicated. To assess the potential for noncarcinogenic health effects posed by exposure to multiple chemicals and multiple exposure pathways, a "hazard index" approach is used (USEPA, 1989). This approach assumes that noncarcinogenic hazards associated with exposure to more than one chemical and pathway are additive. Synergistic or antagonistic interactions between chemicals are not accounted for. The hazard index (HI) may exceed one even if all of the individual HQs are less than one. The chemicals may then be segregated by similar mechanisms of toxicity and toxicological effects, and separate HIs derived based on mechanism and target organs affected.

6.6.1.2 Carcinogenic Risk Estimation

The potential for carcinogenic effects due to exposure to site-related contamination is evaluated by estimating excess lifetime cancer risk. Excess lifetime carcinogenic risk is the incremental increase in the probability of developing cancer during one's lifetime in addition to the background probability of developing cancer. The background incidence of cancer in the U.S. population is approximately 30 percent (including both lethal and non-lethal forms). Therefore, a 2×10^{-6} excess lifetime carcinogenic risk means that an individual's probability of developing cancer in his or her lifetime changes from approximately 0.300000 to 0.300002. Or, expressed another way, for every 1 million people exposed to the carcinogen throughout their lifetime, the incidence of cancer *may* increase by two cases.

The carcinogenic risk is calculated by multiplying the intake by the CSF.

$$CR = \text{Intake} \times CSF$$

The combined risk from exposure to multiple chemicals at a site was evaluated by adding the risks from individual chemicals. Risks were also added across the pathways, if an individual would be exposed through multiple pathways. For example, a person contacting the soil could be exposed by both the oral and dermal pathways.

When a cumulative carcinogenic risk to an individual receptor under the assumed exposure conditions at the site exceeds 100 in a million (10^{-4} excess cancer risk), CERCLA generally

requires remedial action to reduce risks at the site (USEPA, 1991). If the cumulative risk is less than 10^{-4}, action generally is not required, but may be warranted if a risk-based chemical-specific standard, for example, maximum contaminant level (MCL), is exceeded. A risk-based remedial decision could be superseded by the presence of an environmental impact requiring action at the site.

6.6.2 Risk Assessment Results

A summary of the results is shown in Table 6-4 for the RMEs and Table 6-5 for the CTEs. CTE risks were calculated when the RME hazards exceeded 1 or the cancer risks exceeded 10^{-4}.

The noncarcinogenic and carcinogenic risks are calculated in Appendix G, Tables 7.1.RME through 7.11.RME, and 7.1.CTE through 7.4.CTE. Tables 9.1.RME through 9.11.RME in Appendix G summarize the RME total potential risks to each receptor. Tables 9.1.CTE through 9.4.CTE in Appendix G summarize the CTE total potential risks to each receptor that had risks that exceeded an HI of 1.0 or a carcinogenic risk of 1×10^{-4}. Tables 10.1.RME through 10.5.RME and Tables 10.1.CTE through 10.3.CTE in Appendix G summarize only the chemicals that contribute an HI above 0.1 to a total HI greater than 1.0, or a cancer risk greater than 10^{-6} to a total carcinogenic risk greater than 10^{-4}.

6.6.2.1 Current Utility Worker

The risk assessment assumed that a current utility worker could be exposed to Site 28 combined surface and subsurface soil. The total current RME noncarcinogenic hazard to an adult utility worker exposed to soil (0.16) is below USEPA's target noncarcinogenic hazard level (Appendix G, Table 9.1 RME). The carcinogenic risk to an adult utility worker exposed to soil (1.4×10^{-5}) is within the USEPA's target carcinogenic risk range of 1×10^{-4} to 1×10^{-6}.

As discussed in Section 6.5.3, the Adult Lead Model was used to evaluate potential impacts of exposure to lead in the combined surface and subsurface soil in the area of Swale 3. The results indicated that exposure to surface and subsurface soil at the upper end of the estimated range of parameter values would be a potential concern for the fetuses of female utility workers.

6.6.2.2 Current Adult Trespasser

The risk assessment assumed that a current adult trespasser might be exposed to surface soil at Site 28. The total RME noncarcinogenic hazard (0.34) and carcinogenic risk (2.6×10^{-5}) for an adult trespasser exposed to surface soil are below USEPA's target levels (Appendix G, Table 9.2.RME).

As discussed in Section 6.5.3, the Adult Lead Model was used to evaluate potential impacts of exposure to lead in the combined surface and subsurface soil in the area of Swale 3. The results indicated that exposure to surface and subsurface soil at the upper end of the estimated range of parameter values would be a potential concern for the fetuses of female adult trespassers.

6.6.2.3 Current Adolescent Trespasser

The risk assessment assumed that a current adolescent trespasser might be exposed to surface soil at Site 28. The total RME noncarcinogenic hazard (0.42) and carcinogenic risk (1.2×10^{-5}) for an adolescent trespasser exposed to surface soil are below USEPA's target levels (Appendix G, Table 9.3.RME).

Potential impact of exposure to lead in surface and subsurface soil in the area of Swale 3 was not evaluated for the adolescent trespasser because the Adult Lead Model does not assume a reasonable exposure scenario for this receptor.

6.6.2.4 Current/Future Recreational Adult

This risk assessment assumed that a current and/or potential future recreational adult might be exposed to surface water in the swales at Site 28. The total RME noncarcinogenic hazard (0.0019) and carcinogenic risk (2.9×10^{-7}) for a current/future adult recreational user exposed to surface water are below USEPA's target levels (Appendix G, Table 9.4.RME).

Current and/or potential future recreational adults may ingest the fish caught from the Mattawoman Creek. This pathway was not evaluated quantitatively since no fish tissue samples were collected. Section 7.6 and Table 7-27 present information regarding potential uptake of constituents in Mattawoman Creek sediment by fish. Since some of the constituents detected in the sediment could accumulate in fish tissue (e.g., arsenic, lead, and mercury), it can not be concluded that there is no exposure to constituents via fish ingestion for current/future recreational adults. Additional site-specific information would be necessary to quantitatively evaluate this potential exposure route.

6.6.2.5 Current/Future Recreational Adolescent

This risk assessment assumed that a current and/or potential future recreational adolescent might be exposed to surface water in the Mattawoman Creek at Site 28. The total RME noncarcinogenic hazard (0.0025) and carcinogenic risk (1.5×10^{-7}) for a current/future adolescent recreational user exposed to surface water are below USEPA's target levels (Appendix G, Table 9.5.RME).

Current and/or potential future recreational adolescents may ingest the fish caught from the Mattawoman Creek. This pathway was not evaluated quantitatively since no fish tissue samples were collected.

6.6.2.6 Future Resident

It was assumed that potential future adult and child residents living on-site might be exposed to the site groundwater and soil.

Exposure to groundwater would result in a hazard greater than USEPA's target level for adult (HI=40) and child (HI =94) residents (Appendix G, Tables 9.6.RME and 9.7.RME). The main hazard contributors are arsenic, iron, and vanadium, all contributing individual HQs over 1. Both the ingestion and dermal contact routes contribute hazards above 1. The main contributors to the noncancer hazard indices for the child are aluminum, arsenic, cadmium, iron, manganese, and vanadium, all contributing individual HQs over 1.

The maximum detected constituent concentrations were used as the EPCs for groundwater due to the limited number of samples available. This may result in an overestimation of the risk. The maximum detected concentrations of cadmium, iron, and vanadium were not much higher than the 95 percent upper tolerance limit (UTL) of the background groundwater data presented in the Background Investigation Report (Appendix E). The maximum detected concentrations of aluminum and manganese in the site related groundwater was less than that of the 95 percent UTL of the background groundwater data. Therefore, all of the COPCs, and calculated hazard, may not be solely associated with Site 28, but may also be associated with background groundwater conditions. However, based on arsenic alone, which was not detected in the background groundwater samples, the hazard would still be above 1 for the adult and child resident. Exposure to groundwater through potable use by a lifetime resident would result in a carcinogenic risk (7.8×10^{-3}) above USEPA's target risk range, based on RME exposure assumptions (Appendix G, Table 9.8.RME). The groundwater risk driver is arsenic.

A CTE hazard analysis was conducted for exposure to groundwater for an adult and child resident (Appendix G, Tables 9.1.CTE and 9.2.CTE). The resulting CTE hazard for both a residential adult (7.0) and child (16.9) exposed to groundwater is greater than 1.0. Arsenic and iron are the main contributors to the CTE hazard. A CTE risk evaluation was conducted for groundwater for a lifetime resident. The CTE carcinogenic risk for groundwater (8.2×10^{-4}) is also above 1×10^{-4}.

The RME noncarcinogenic hazard to adult (HI = 1.3) and child (HI = 11) residents exposed to soil exceeds USEPA's target noncarcinogenic hazard level (Appendix G, Tables 9.6.RME and 9.7.RME). These hazards are associated with the ingestion of inorganics, mainly arsenic and zinc, from the soil. Future lifetime resident (Appendix G, Table 9.8.RME) exposure to soil at Site 28 would result in a carcinogenic risk (3.3×10^{-4}) that is above the USEPA target carcinogenic risk levels. This risk is associated with ingestion and dermal contact with arsenic in soil.

CTE hazards were calculated for the adult and child resident for exposure to soil. The CTE hazards for the adult (0.10) and child (0.83) resident are below USEPA's target HI (Appendix G, Tables 9.1.CTE and 9.2.CTE). A CTE risk for the future lifetime resident was calculated. The CTE risk for the lifetime resident (1.4×10^{-5}) is within the USEPA target carcinogenic risk range (Appendix G, Table 9.3.CTE).

As discussed in Section 6.5.3, the IEUBK model was used to quantitatively assess potential impacts of exposure to lead in soil in the area of Swale 3 by the residential child. The results indicated that exposure to soil would potentially be a health concern for future child residents.

6.6.2.7 Future Construction Worker

Exposure to soil through incidental ingestion and dermal contact, and to groundwater through dermal contact, was evaluated for a future construction worker. The total potential future RME noncarcinogenic hazard exceeds USEPA's target hazard level (Appendix G, Table 9.9.RME). The hazard due to exposure to soil is 3.9, mainly due to arsenic, and the hazard associated with groundwater is 2.0. For groundwater, there are no individual

constituents contributing HIs above 1. The RME carcinogenic risks for a construction worker exposed to soil (1.4×10^{-5}) and groundwater (5.3×10^{-6}) are within the USEPA's target range.

A CTE risk calculation was performed for noncarcinogenic and carcinogenic risks for soil and groundwater (Appendix G, Table 9.4.CTE). The CTE hazards and risks for exposure to soil and groundwater are all below USEPA's target risk levels.

As discussed in Section 6.5.3, the Adult Lead Model was adjusted and used to evaluate potential impacts of exposure to lead in surface and subsurface soil in the area of Swale 3 to a future construction worker. The results indicated that exposure to lead in this area would potentially be a health concern for fetuses of pregnant female construction workers.

6.6.2.8 Future Adult Trespasser

The risk assessment assumed that a potential future adult trespasser might be exposed to soil at Site 28. The total RME noncarcinogenic hazard (0.29) and carcinogenic risk (2.1×10^{-5}) for an adult trespasser exposed to soil are below or within USEPA's target levels (Appendix G, Table 9.10.RME).

As discussed in Section 6.5.3, the Adult Lead Model was adjusted and used to evaluate potential impacts of exposure to lead in surface and subsurface soil in the area of Swale 3 for the adult trespasser. The results indicated that exposure to surface and subsurface soil at the upper end of the estimated range of parameter values would be a potential concern for the fetuses of female adult trespassers.

6.6.2.9 Future Adolescent Trespasser

The risk assessment assumed that a potential future adolescent trespasser might be exposed to soil at Site 28. The total RME noncarcinogenic hazard (0.36) and carcinogenic risk (9.8×10^{-6}) for an adolescent trespasser exposed to soil are below or within USEPA's target levels (Appendix G, Table 9.11.RME).

Potential impact of exposure to lead in surface and subsurface soil in the area of Swale 3 was not evaluated for the adolescent trespasser because the Adult Lead Model does not assume a reasonable exposure scenario for this receptor.

6.7 Uncertainty Associated with Human Health Assessment

The risk measures used in site risk assessments are not fully probabilistic estimates of risk but are conditional estimates given that a set of assumptions about exposure and toxicity are realized. Thus it is important to specify the assumptions and uncertainties inherent in the risk assessment to place the risk estimates in proper perspective.

6.7.1 General Uncertainty in COPC Selection

The uncertainty in sampling and possibility of missing a contaminated location is expected to be minimal at this site because of the amount of sampling data available for the site. The quantitative uncertainty associated with the other factors is also minimal because the data were validated prior to use in the risk assessment. The general assumptions used in the COPC selection are conservative to ensure the estimation of highest possible risk.

A number of SVOCs were detected in only one of the 70 soil samples collected at Site 28. These SVOCs were all detected in sample IS28SS36-0001 at concentrations around 100 µg/kg and qualified with a J. SVOCs were not detected in most of the samples collected around sample IS28SS36-0001. As discussed in Appendix C, Section J.1.4, the SVOCs detected in IS28SS36-0001 are likely the result of erroneous laboratory results. After discussion with the data validator, the validator agreed that the samples should be rejected (see Appendix C, Attachment B). However, none of the SVOCs that were detected in only this sample were retained as a COPC, and therefore, this sample does not impact the results of the risk assessment.

Comparison of the site data to background data was not used as a criterion in the selection of the COPCs. Therefore, some of the constituents that have been retained as COPCs and carried through the risk assessment may be present at concentrations consistent with background conditions at NDWIH.

6.7.2 Uncertainty Associated with Exposure Assessment

The most significant source of uncertainty associated with the exposure assessment is the underlying assumption that contact with affected media would occur under current land use conditions, and that the land use and human activity patterns assumed for the hypothetical future scenarios would occur. There is no information to suggest that recreationalists, trespassers, or utility workers currently at NDWIH routinely come into contact with affected media in the course of their daily activities (or will in the future); therefore, the generic exposure assumptions used to evaluate exposure are likely to overestimate current (and future) exposure.

Most of the exposure pathways analyzed are assumed, and exposure factors used for quantitation of exposure are conservative and reflect worst-case or upper-bound assumptions on the exposure. Most of the exposure pathways evaluated for Site 28 are hypothetical and are not likely to occur in the future. Site 28 is not expected to be used for residential use, so the inclusion of this receptor in the assessment is conservative.

The future soil exposure scenario adds additional conservatism by assuming that the subsurface soil will become surface soil during any future construction activities. During many construction projects, clean fill material is placed over the soil that is disturbed during excavation projects. The clean fill material is generally needed to support growth of grass and other landscape plants.

The percent of a chemical absorbed through the skin is likely to be affected by many parameters. Some of the parameters include soil loading, soil moisture content, organic content, pH, and presence of other constituents. The availability of a chemical depends on site-specific fate and transport properties of the chemical species available for eventual absorption of skin. Chemical concentrations, specific properties of the chemical, and soil release kinetics all impact the amount of a chemical that is absorbed. These factors contribute to the uncertainty associated with these estimates and make quantitation of the amount of certain chemicals absorbed from soil difficult.

6.7.3 Uncertainty Associated with Toxicity Assessment

Uncertainty associated with the noncarcinogenic toxicity factors is included in Appendix G, Tables 5.1 and 5.2. Several UFs were applied to extrapolate dose points from animal studies to humans. The UFs range between 1 and 300. Therefore, there is a degree of uncertainty in the noncarcinogenic toxicity criteria, based on the available scientific data for each compound. The noncarcinogenic toxicity factors are most likely an overestimate of actual toxicity.

Use of provisional toxicity factors increases the degree of uncertainty associated with the Site 28 risk assessment. Provisional RfDs for aluminum and iron were used in this assessment. The USEPA does not include an RfD for aluminum or iron in IRIS or HEAST, so a provisional value from NCEA was used.

Iron is an essential human nutrient, which complicates the derivation of an RfD (USEPA, January 1999). The future child resident had an estimated HQ from ingestion of iron in soil of 0.96, which is below the USEPA target value of 1. Therefore, exposure to iron in soil by child residents should not be considered a health concern. However, the future child resident had an estimated HQ from ingestion of iron in groundwater of 14, which is above the USEPA target value of 1. The RME intake of iron via incidental ingestion of groundwater (4.2 mg/kg-day; Appendix G, Table 7.7) also exceeds the RDA range for children ages 6 months to 10 years (0.36–1.11 mg/kg-day) (USEPA, 1999). Therefore, exposure to iron in groundwater by child residents should be considered a health concern since it exceeds the range associated with levels that meet the known nutrient needs of healthy individuals.

Although the oral RfD for manganese is not provisional (that is, the RfD has been approved by a USEPA workgroup), the derivation of toxicity factors for essential nutrients is complicated, and therefore, warrants further discussion. Manganese is an essential human nutrient responsible for activating several enzymes (USEPA, 2003b). Disease states have been documented in humans associated with both deficiencies and excess intakes of manganese (USEPA, 2003b). The IRIS profile for manganese states, "The reference dose is estimated to be an intake for the general population that is not associated with adverse health effects; this is not meant to imply that intakes above the reference dose are necessarily associated with toxicity. Some individuals may, in fact, consume a diet that contributes more than 10 mg Mn/day without any cause for concern," (USEPA, 2003b). Exposure to manganese in groundwater resulted in an HQ of 1.4 for future child residents. However, the National Research Council has determined an "estimated safe and adequate daily dietary intake" (ESADDI) of manganese to be 2–5 mg/day for adults (USEPA, 2003b). The highest dissolved manganese concentration was 441 µg/L, so at least 5 liters of water from that location would have to be consumed per day to intake just 2 mg/day of manganese. An ESADDI for children was not provided, and therefore, this comparison can not be made. However, the essential human requirement should be considered when reviewing the manganese HQ.

Carcinogenic slope factors developed by the USEPA represent upper bound estimates. Any carcinogenic risks generated in this assessment should be regarded as an upper bound estimate on the potential carcinogenic risks rather than an accurate representation of carcinogenic risk. The true carcinogenic risk is likely to be less than the predicted value.

The RfD for vanadium used in the risk assessment is derived from human data (NCEA, 2000). The same reference (NCEA, 2000) also lists an RfD derived from animal data, which is lower. Based on a review of the NCEA document and discussions with USEPA toxicologists, it is appropriate to use the higher, human-based RfD.

6.7.4 Uncertainty in Risk Characterization

The uncertainties identified in each component of risk assessment ultimately contribute to uncertainty in risk characterization. The addition of risks and HIs across pathways and chemicals contributes to uncertainty based on the interaction of chemicals such as additivity, synergism, potentiation, susceptibility of exposed receptors, etc.

One essential nutrient, iron, was identified as a potential risk driver for the child resident. However, the receptor-specific intake was consistent with established safe or recommended daily doses. Therefore the RME risk characterization for these constituents should be reviewed in conjunction with important toxicological information regarding daily intakes estimated to prevent conditions related with deficiencies of these constituents.

Sufficient information was not available to quantitatively characterize current/future recreational adult exposure to site-constituents via ingestion of fish from Mattawoman Creek. However, this is addressed in the Mattawoman Creek Study for the creek as a whole (Tetra Tech NUS, 2002). This is a potentially complete exposure pathway and the ERA (Section 7) indicates that sediment constituents could be taken up by fish in Mattawoman Creek. Since neither fish population nor tissue data was available, the exposure was not quantified and the qualitative risk characterization only provides tentative conclusions regarding exposure rather than risk.

The use of the Adult Lead Model to evaluate risks associated with exposure to lead in soil by utility workers, construction workers, and adult trespassers results in uncertainty in the risk characterization. The Adult Lead Model was developed to evaluate risks to industrial workers, based on standard worker exposure assumptions. Use of this model for other than industrial receptors may result in an underestimate or overestimate of risks to these receptors.

6.8 Summary

This risk assessment was conducted to evaluate the potential human health risks associated with the presence of site-related surface soil, combined surface and subsurface soil, groundwater, sediment, and surface water at Site 28, NDWIH. Potential risks were calculated for a current utility worker, current and future adult and adolescent trespasser, current/future adult and adolescent recreational user, future adult resident, future child resident, future lifetime resident, and future construction worker. This baseline risk assessment was conducted to characterize the potential future human health risks at Site 28 if no additional remediation is implemented.

Appendix G, Tables 9.1.RME through 9.11.RME and Tables 9.1.CTE through 9.4.CTE summarize the RME and CTE potential hazards and risks to each receptor. Appendix G, Tables 10.1.RME through 10.5.RME, and 10.1.CTE through 10.3.CTE show only the

chemicals that contributed HIs greater than 0.1 to total HIs greater than 1.0, or carcinogenic risks greater than 10^{-6} to total carcinogenic risks greater than 10^{-4}.

There are no risks or hazards that exceed USEPA target levels for the utility worker exposed to site soil, adult and adolescent trespassers exposed to site soil (current or future), or adult and adolescent recreationalists exposed to surface water. All potential exposures to surface soil and surface water result in hazards and risks within USEPA target levels. Exposure to sediment was not quantified since it is not a complete exposure pathway.

The following receptors had total RME noncarcinogenic hazards or carcinogenic risks that exceeded USEPA's target levels:

- Future adult resident exposed to groundwater
- Future child resident exposed to groundwater
- Future lifetime resident exposed to groundwater
- Future adult resident exposed to soil
- Future child resident exposed to soil
- Future lifetime resident exposed to soil
- Future construction worker exposed to groundwater
- Future construction workers exposed to soil

Future exposure to combined surface and subsurface soil by a child and adult resident, and construction worker may result in a noncarcinogenic hazard above USEPA's target hazard index of 1.0. Arsenic and zinc are the only constituents which contribute individual HIs above 1 (arsenic for the child resident and construction worker, and zinc for the child resident) to the total HI. The CTE noncarcinogenic hazards are below USEPA's target HI for all three receptors. Future exposure to combined surface and subsurface soil by a lifetime resident may result in a carcinogenic risk above USEPA's target range of 1×10^{-6} to 1×10^{-4}. Exposure to arsenic in the combined soil contributes to the cancer risk for future lifetime residents. The CTE carcinogenic risk to the lifetime resident is within USEPA's target risk range.

While exposure to combined surface and subsurface soil by a future commercial worker was not quantitatively evaluated in this risk assessment, the noncarcinogenic hazard is expected to be below USEPA's target hazard index of 1.0. The RME noncarcinogenic hazard to an adult resident exposed to soil (HI=1.3), which is the most directly analogous receptor of those evaluated to a commercial worker, only marginally exceeds USEPA's target hazard level. Therefore, the RME hazard to the less-exposed commercial worker would likely be less than the target HI of 1.0, and thus would result in an acceptable risk. In addition, the CTE noncarcinogenic hazards and CTE carcinogenic risks to residential exposure to soil are below USEPA's target HI or within USEPA's target risk range. Therefore, the CTE hazards and risks to future commercial workers will result in an acceptable risk.

The average concentrations of lead in surface soil and combined surface and subsurface soil (142 and 58.5 mg/kg, respectively) were below the USEPA recommended level. However, detected concentrations of lead in 12 of the 70 soil samples were above the soil screening value of 400 mg/kg, some of them greater than 25 times the soil screening value. These samples were collected in a limited, geographically continuous area of the northeast quadrant of the site, near Swale 3 (Figure 6-2). Based on the lead analysis in the vicinity of

Swale 3, exposure to surface and subsurface soil in this area would potentially be a concern for fetuses of expectant construction workers, fetuses of expectant utility workers (if they are exposed at the upper end of the estimated range of parameter values), fetuses of expectant adult trespassers (if they are exposed at the upper end of the estimated range of parameter values), and future child residents.

It is extremely unlikely that the surficial groundwater at Site 28 will be used as a future source of potable water, due to the low yield and availability of better water supplies. However, future potable use of the groundwater was evaluated in the risk assessment. Future potable use of the groundwater would result in a noncarcinogenic hazard above USEPA's target hazard index of 1.0 to child and adult residents. The hazard is associated with a number of inorganic constituents. The majority of these constituents, excluding arsenic, were also detected in the background groundwater at concentrations that appear to be similar to those on site. However, even if they are considered background-related, arsenic alone would pose a hazard above USEPA's target hazard index of 1.0. The CTE hazards are also above 1.0. Future exposure to groundwater by a lifetime resident may result in a carcinogenic risk above USEPA's target range. This risk is also driven by arsenic in the groundwater. The CTE risk is also above USEPA's target range.

Future construction work involving unprotected contact with the groundwater would result in risks within USEPA target levels. The noncarcinogenic hazard is above the USEPA target of 1.0 for the RME scenario. The CTE scenario results in an HI within the target range.

In summary, there would be potentially unacceptable risks to future residents if the site is used for future residential purposes. Additionally, construction workers involved in excavation activities at the site may also face potential unacceptable risks associated with exposure to soil and groundwater, although the CTE scenario is within the USEPA target range. Exposure to lead in surface and subsurface soil also would be a potential concern for fetuses of expectant construction workers, utility workers, and adult trespassers, and for future child residents.

6.9 References

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Table 6-1
Summary of Data Quantitatively Used in Risk Assessment
Site 28 RI Report, NDWIH, Indian Head, Maryland
IHDIV-NSWC

Medium	Date of Sampling	Sample	Parameters
Soil			
Surface Soil	19-May-03	IS28SS41-0001	EXPLO, METALS, SVOA, VOA
	19-May-03	IS28SS40-0001	EXPLO, METALS, SVOA, VOA
	19-May-03	IS28SS32-0001	EXPLO, METALS, SVOA, VOA
	19-May-03	IS28SS38-0001	EXPLO, METALS, SVOA, VOA
	19-May-03	IS28SS36-0001	EXPLO, METALS, SVOA, VOA
	19-May-03	IS28SS35-0001	EXPLO, METALS, SVOA, VOA
	19-May-03	IS28SS33-0001	EXPLO, METALS, SVOA, VOA
	19-May-03	IS28SS37-0001	EXPLO, METALS, SVOA, VOA
	19-May-03	IS28SS21-0001	EXPLO, METALS, SVOA, VOA
	19-May-03	IS28SS26-0001	EXPLO, METALS, SVOA, VOA
	19-May-03	IS28SS29-0001	EXPLO, METALS, SVOA, VOA
	20-May-03	IS28SS28-0001	EXPLO, METALS, SVOA, VOA
	20-May-03	IS28SS12-0001	EXPLO, METALS, SVOA, VOA
	20-May-03	IS28SS04-0001	EXPLO, METALS, SVOA, VOA
	20-May-03	IS28SS20-0001	EXPLO, METALS, SVOA, VOA
	12-May-03	IS28SS09-0001	EXPLO, METALS, SVOA, VOA
	12-May-03	IS28SS17-0001	EXPLO, METALS, SVOA, VOA
	13-May-03	IS28SS08-0001	EXPLO, METALS, SVOA, VOA
	13-May-03	IS28SS10-0001[a]	EXPLO, METALS, SVOA, VOA
	13-May-03	IS28SS19-0001[a]	EXPLO, METALS, SVOA, VOA
	13-May-03	IS28SS15-0001[a]	EXPLO, METALS, SVOA, VOA
	13-May-03	IS28SS13-0001	EXPLO, METALS, SVOA, VOA
	13-May-03	IS28SS18-0001[a]	EXPLO, METALS, SVOA, VOA
	13-May-03	IS28SS11-0001[a]	EXPLO, METALS, SVOA, VOA
	14-May-03	IS28SS22-0001	EXPLO, METALS, SVOA, VOA
	14-May-03	IS28SS24-0001	EXPLO, METALS, SVOA, VOA
	14-May-03	IS28SS42-0001[a]	EXPLO, METALS, SVOA, VOA
	15-May-03	IS28SS14-0001[a]	EXPLO, METALS, SVOA, VOA
	15-May-03	IS28SS06-0001	EXPLO, METALS, SVOA, VOA
	15-May-03	IS28SS23-0001[a]	EXPLO, METALS, SVOA, VOA
	16-May-03	IS28SS07-0001	EXPLO, METALS, SVOA, VOA
	16-May-03	IS28SS27-0001	EXPLO, METALS, SVOA, VOA
	12-May-03	IS28SS02-0001	EXPLO, METALS, SVOA, VOA
	12-May-03	IS28SS03-0001	EXPLO, METALS, SVOA, VOA
	12-May-03	IS28SS05-0001	EXPLO, METALS, SVOA, VOA
	19-May-03	IS28SS21-0001P	EXPLO, METALS, SVOA, VOA
	19-May-03	IS28SS40-0001P	EXPLO, METALS, SVOA, VOA
	20-May-03	IS28SS04-0001P	EXPLO, METALS, SVOA, VOA
	13-May-03	IS28SS11-0001P[a]	EXPLO, METALS, SVOA, VOA

Table 6-1
Summary of Data Quantitatively Used in Risk Assessment
Site 28 RI Report, NDWIH, Indian Head, Maryland
IHDIV-NSWC

Medium	Date of Sampling	Sample	Parameters
Subsurface Soil	19-May-03	IS28SB41-0103	EXPLO, METALS, SVOA, VOA
	19-May-03	IS28SB40-0103	EXPLO, METALS, SVOA, VOA
	19-May-03	IS28SB32-0103	EXPLO, METALS, SVOA, VOA
	19-May-03	IS28SB38-0103	EXPLO, METALS, SVOA, VOA
	19-May-03	IS28SB36-0103	EXPLO, METALS, SVOA, VOA
	19-May-03	IS28SB35-0103	EXPLO, METALS, SVOA, VOA
	19-May-03	IS28SB33-0103	EXPLO, METALS, SVOA, VOA
	19-May-03	IS28SB37-0103	EXPLO, METALS, SVOA, VOA
	19-May-03	IS28SB21-0103	EXPLO, METALS, SVOA, VOA
	19-May-03	IS28SB26-0103	EXPLO, METALS, SVOA, VOA
	19-May-03	IS28SB29-0103	EXPLO, METALS, SVOA, VOA
	20-May-03	IS28SB28-0103	EXPLO, METALS, SVOA, VOA
	20-May-03	IS28SB12-0103	EXPLO, METALS, SVOA, VOA
	20-May-03	IS28SB04-0103	EXPLO, METALS, SVOA, VOA
	20-May-03	IS28SB20-0103	EXPLO, METALS, SVOA, VOA
	12-May-03	IS28SB05-0103	EXPLO, METALS, SVOA, VOA
	12-May-03	IS28SB09-0103	EXPLO, METALS, SVOA, VOA
	12-May-03	IS28SB17-0103	EXPLO, METALS, SVOA, VOA
	13-May-03	IS28SB08-0103	EXPLO, METALS, SVOA, VOA
	13-May-03	IS28SB10-0103[a]	EXPLO, METALS, SVOA, VOA
	13-May-03	IS28SB15-0103[a]	EXPLO, METALS, SVOA, VOA
	13-May-03	IS28SB18-0103[a]	EXPLO, METALS, SVOA, VOA
	13-May-03	IS28SB11-0103[a]	EXPLO, METALS, SVOA, VOA
	14-May-03	IS28SB22-0103	EXPLO, METALS, SVOA, VOA
	14-May-03	IS28SB24-0103	EXPLO, METALS, SVOA, VOA
	14-May-03	IS28SB42-0103[a]	EXPLO, METALS, SVOA, VOA
	15-May-03	IS28SB14-0103[a]	EXPLO, METALS, SVOA, VOA
	15-May-03	IS28SB06-0103	EXPLO, METALS, SVOA, VOA
	15-May-03	IS28SB23-0103[a]	EXPLO, METALS, SVOA, VOA
	16-May-03	IS28SB07-0103	EXPLO, METALS, SVOA, VOA
	16-May-03	IS28SB27-0103	EXPLO, METALS, SVOA, VOA
	12-May-03	IS28SB02-0103	EXPLO, METALS, SVOA, VOA
	12-May-03	IS28SB03-0103	EXPLO, METALS, SVOA, VOA
	13-May-03	IS28SB19-0105[a]	EXPLO, METALS, SVOA, VOA
	13-May-03	IS28SB13-0105	EXPLO, METALS, SVOA, VOA
	19-May-03	IS28SB33-0103P	EXPLO, METALS, SVOA, VOA
	19-May-03	IS28SB21-0103P	EXPLO, METALS, SVOA, VOA
	13-May-03	IS28SB13-0105P	EXPLO, METALS, SVOA, VOA
Surface Water			
	21-May-03	IS28SW01-0503	EXPLO, TOTAL METALS, FILTERED METALS, SVOA, VOA
	21-May-03	IS28SW02-0503	EXPLO, TOTAL METALS, FILTERED METALS, SVOA, VOA
	20-May-03	IS28SW03-0503	EXPLO, TOTAL METALS, FILTERED METALS, SVOA, VOA
	20-May-03	IS28SW03-0503P	EXPLO, TOTAL METALS, FILTERED METALS, SVOA, VOA
Groundwater			
	9-Sep-03	IS28MW010903	EXPLO, TOTAL METALS, FILTERED METALS, SVOA, VOA
	9-Sep-03	IS28MW020903	EXPLO, TOTAL METALS, FILTERED METALS, SVOA, VOA
	10-Sep-03	IS28MW030903	EXPLO, TOTAL METALS, FILTERED METALS, SVOA, VOA
	9-Sep-03	IS28MW040903	EXPLO, TOTAL METALS, FILTERED METALS, SVOA, VOA

[a] Lead results from sample used in hot spot analysis

Table 6-2
Summary of Chemicals of Potential Concern for Human Health
Site 28 RI Report, NDWIH, Indian Head, Maryland

Surface Soil	Soil*	Surface Water	Groundwater
			Tap Water
Benzo(a)pyrene	Benzo(a)pyrene	Arsenic	bis(2-Ethylhexyl)phthalate
Benzo(b)fluoranthene	Benzo(b)fluoranthene	Lead	Aluminum
Dibenz(a,h)anthracene	Dibenz(a,h)anthracene		Antimony
Indeno(1,2,3-cd)pyrene	Indeno(1,2,3-cd)pyrene		Arsenic
n-Nitroso-di-n-propylamine	n-Nitroso-di-n-propylamine		Cadmium
Aluminum	Aluminum		Chromium
Antimony	Antimony		Iron
Arsenic	Arsenic		Manganese
Barium	Barium		Vanadium
Cadmium	Cadmium		Zinc
Chromium	Chromium		
Copper	Copper		*Water in Excavation Pit*
Iron	Iron		Aluminum
Lead	Lead		Antimony
Manganese	Manganese		Arsenic
Mercury	Mercury		Cadmium
Vanadium	Nickel		Chromium
Zinc	Thallium		Iron
	Vanadium		Vanadium
	Zinc		Zinc

* Combines surface and subsurface soil.

Table 6-3
Exposure Pathways
Site 28 RI Report, NDWIH, Indian Head, Maryland

Media	Exposure Route	Current			Current/Future		Future				
		Utility Worker	Trespasser		Recreation		Construction Worker	Trespasser		Resident	
			Adult	Adolescent	Adult	Adolescent		Adult	Adolescent	Adult	Child
Surface Soil	Ingestion		X	X							
	Dermal		X	X							
	Inhalation		X^1	X^1							
Fish	Ingestion				X^2	X^2					
Groundwater	Ingestion	I								X	X
	Dermal	I					X			X	X
	Inhalation	I					X			X	
Surface Water	Ingestion				X	X					
	Dermal				X	X					
	Inhalation										
Sediment	Ingestion				I	I					
	Dermal				I	I					
	Inhalation										
Soil*	Ingestion	X					X	X	X	X	X
	Dermal	X					X	X	X	X	X
	Inhalation	X'					X'	X'	X'	X'	X'

X = Quantitative evaluation.

X^1 = No COPCs retained for this pathway, therefore, pathway not quantitatively evaluated.

X^2 = Qualitative evaluation.

I = Incomplete exposure pathway.

* Combines surface and subsurface soil.

Table 6-4
Summary of RME Cancer Risks and Hazard Indexes
Site 28 RI Report, NDWIH, Indian Head, Maryland

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks $>10^{-4}$	Chemicals with Cancer Risks $>10^{-5}$ and $<10^{-4}$	Chemicals with Cancer Risks $>10^{-6}$ and $<10^{-5}$	Hazard Index	Chemicals with HI>1
Current Utility Worker	Soil*	Ingestion	1.3E-05		Arsenic		0.14	
		Dermal Contact	8.7E-07				0.015	
		Inhalation	NA				NA	
		Total	1.4E-05		Arsenic		0.16	
Current Trespasser - Adult	Surface Soil	Ingestion	1.7E-05		Arsenic		0.18	
		Dermal Contact	9.5E-06			Arsenic	0.16	
		Inhalation	NA				NA	
		Total	2.6E-05		Arsenic		0.34	
Current Trespasser - Adolescent	Surface Soil	Ingestion	8.6E-06			Arsenic	0.25	
		Dermal Contact	3.8E-06			Arsenic	0.17	
		Inhalation	NA				NA	
		Total	1.2E-05		Arsenic		0.42	
Current/Future Recreation - Adult	Surface Water	Ingestion	2.6E-07				0.0017	
		Dermal Contact	3.2E-08				0.00021	
		Inhalation	NA				NA	
		Total	2.9E-07				0.0019	
Current/Future Recreation - Adolescent	Surface Water	Ingestion	1.3E-07				0.0023	
		Dermal Contact	1.4E-08				0.00024	
		Inhalation	NA				NA	
		Total	1.5E-07				0.0025	
Future Resident - Adult	Soil*	Ingestion	NA				1.0	
		Dermal Contact	NA				0.21	
		Inhalation	NA				NA	
		Total	NA				1.3	
	Groundwater	Ingestion	NA				39	Arsenic, Iron, Vanadium
		Dermal Contact	NA				1.29	
		Inhalation	NA				NA	
		Total	NA				40	Arsenic, Iron, Vanadium
	All Media	Total	NA				41	
Future Resident - Child	Soil*	Ingestion	NA				9.7	Arsenic, Zinc
		Dermal Contact	NA				1.4	
		Inhalation	NA				NA	
		Total	NA				11	Arsenic, Zinc
	Groundwater	Ingestion	NA				90	Aluminum, Arsenic, Cadmium, Iron, Manganese, Vanadium
		Dermal Contact	NA				3.4	
		Inhalation	NA				NA	
		Total	NA				94	Aluminum, Arsenic, Cadmium, Iron, Manganese, Vanadium
	All Media	Total	NA				105	

Table 6-4
Summary of RME Cancer Risks and Hazard Indexes
Site 28 RI Report, NDWIH, Indian Head, Maryland

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks $>10^{-4}$	Chemicals with Cancer Risks $>10^{-5}$ and $<10^{-4}$	Chemicals with Cancer Risks $>10^{-6}$ and $<10^{-5}$	Hazard Index	Chemicals with HI>1
Future Resident - Child/Adult	Soil*	Ingestion	3.0E-04	Arsenic		Benzo(a)pyrene, Dibenz(a,h)anthracene, n-Nitrosodi-n-propylamine	NA	
		Dermal Contact	3.1E-05	Arsenic		Benzo(a)pyrene, Dibenz(a,h)anthracene	NA	
		Inhalation	NA				NA	
		Total	3.3E-04	Arsenic		Benzo(a)pyrene, Dibenz(a,h)anthracene, n-Nitrosodi-n-propylamine	NA	
	Groundwater	Ingestion	7.7E-03	Arsenic		bis(2-Ethylhexyl)phthalate	NA	
		Dermal Contact	1.2E-04		Arsenic	bis(2-Ethylhexyl)phthalate	NA	
		Inhalation	NA				NA	
		Total	7.8E-03	Arsenic		bis(2-Ethylhexyl)phthalate	NA	
	All Media	Total	8.2E-03				NA	
Future Construction Worker	Soil*	Ingestion	1.3E-05		Arsenic		3.5	Arsenic
		Dermal Contact	8.7E-07				0.34	
		Inhalation	NA				NA	
		Total	1.4E-05		Arsenic		3.9	Arsenic
	Groundwater	Ingestion	NA				NA	
		Dermal Contact	5.3E-06				2.0	
		Inhalation	NA				NA	
		Total	5.3E-06				2.0	
	All Media	Total	1.9E-05				5.8	
Future Trespasser - Adult	Soil*	Ingestion	1.3E-05		Arsenic		0.15	
		Dermal Contact	7.5E-06			Arsenic	0.14	
		Inhalation	NA				NA	
		Total	2.1E-05		Arsenic		0.29	
	All Media	Total	2.1E-05				0.29	
Future Trespasser - Adolescent	Soil*	Ingestion	6.9E-06			Arsenic	0.21	
		Dermal Contact	3.0E-06			Arsenic	0.14	
		Inhalation	NA				NA	
		Total	9.8E-06			Arsenic	0.36	
	All Media	Total	9.8E-06				0.36	

NA - Not applicable, pathway incomplete.
*Surface and subsurface soil combined.

Table 6-5
Summary of CTE Cancer Risks and Hazard Indexes
Site 28 RI Report, NDWIH, Indian Head, Maryland

Receptor	Media	Exposure Route	Cancer Risk	Chemicals with Cancer Risks $>10^{-4}$	Chemicals with Cancer Risks $>10^{-5}$ and $<10^{-4}$	Chemicals with Cancer Risks $>10^{-6}$ and $<10^{-5}$	Hazard Index	Chemicals with HI>1
Future Resident - Adult	Soil*	Ingestion	NA				0.059	
		Dermal Contact	NA				0.043	
		Inhalation	NA				NA	
		Total	NA				0.1	
	Groundwater	Ingestion	NA				6.9	Arsenic
		Dermal Contact	NA				0.116	
		Inhalation	NA				NA	
		Total	NA				7.0	Arsenic
	All Media	Total	NA				7.1	
Future Resident - Child	Soil*	Ingestion	NA				0.55	
		Dermal Contact	NA				0.28	
		Inhalation	NA				NA	
		Total	NA				0.83	
	Groundwater	Ingestion	NA				16.6	Arsenic, Iron
		Dermal Contact	NA				0.33	
		Inhalation	NA				NA	
		Total	NA				16.9	Arsenic, Iron
	All Media	Total	NA				17.7	
Future Resident - Child/Adult	Soil*	Ingestion	1.1E-05			Arsenic	NA	
		Dermal Contact	2.9E-06			Arsenic	NA	
		Inhalation	NA				NA	
		Total	1.4E-05		Arsenic		NA	
	Groundwater	Ingestion	8.1E-04	Arsenic			NA	
		Dermal Contact	7.4E-06				NA	
		Inhalation	NA				NA	
		Total	8.2E-04	Arsenic			NA	
	All Media	Total	8.3E-04				NA	
Future Construction Worker	Soil*	Ingestion	3.3E-07				0.11	
		Dermal Contact	4.7E-08				0.030	
		Inhalation	NA				NA	
		Total	3.7E-07				0.14	
	Groundwater	Ingestion	NA				NA	
		Dermal Contact	8.9E-07				0.51	
		Inhalation	NA				NA	
		Total	8.9E-07				0.51	
	All Media	Total	1.3E-06				0.65	

NA - Not applicable, pathway incomplete.
*Surface and subsurface soil combined.

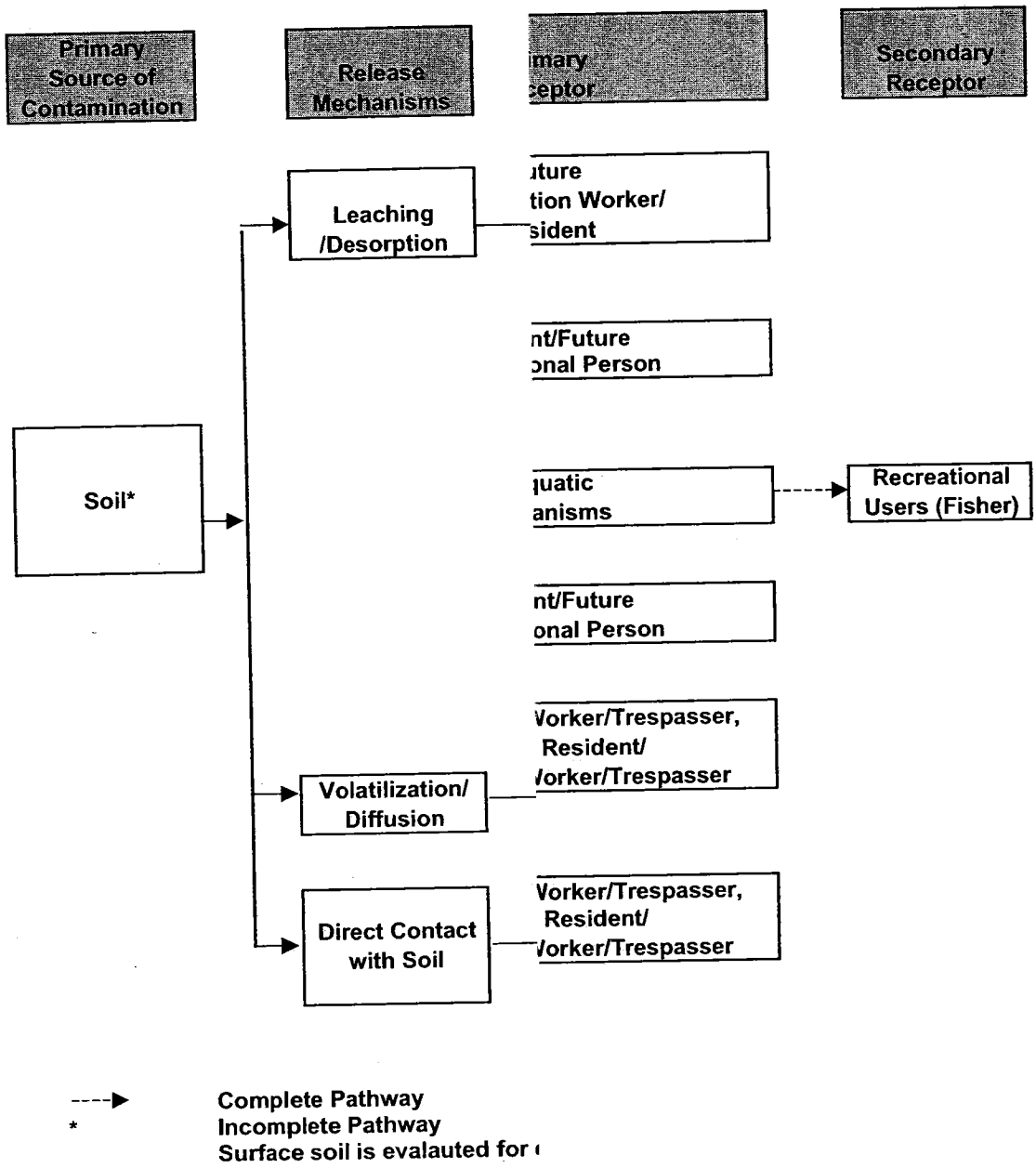
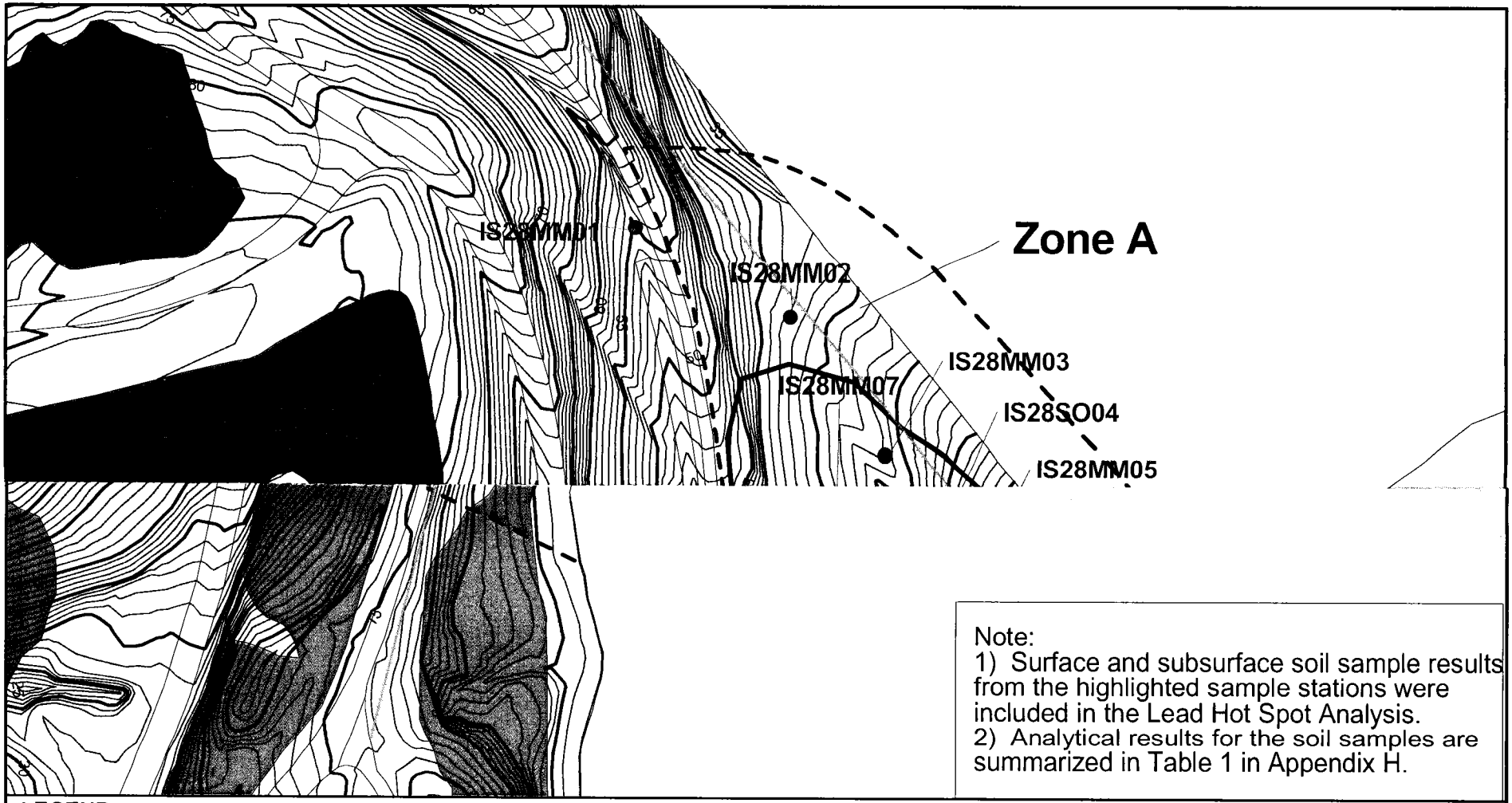


Figure 6-1
eptual Site Model for Potential Human Exposures
Site 28, IHDIV-NSWC
Indian Head, Maryland

File Path: V:\18gis\indianHead\figures\site28_ri.apr



Note:
1) Surface and subsurface soil sample results from the highlighted sample stations were included in the Lead Hot Spot Analysis.
2) Analytical results for the soil samples are summarized in Table 1 in Appendix H.

LEGEND

Sample locations are labeled with the Station ID, as described in Section 3.2.1

- Sample stations included in IEUBK and Adult Lead Models (surface and/or subsurface soil sample results for lead above 400 mg/kg)
- Sample stations with soil sample results for lead below screening level of 400 mg/kg

Zone Boundary
Fence Line
IR Site
Buildings
Railroads
Roads
Five foot Contours
One Foot Contours

N

50 0 50 100 150 Feet

Figure 6-2
Samples Included in Lead Hot Spot Analysis
Site 28 RI Report
NDWIH Indian Head, Maryland

CH2MHILL

SECTION 7

Ecological Risk Assessment (Steps 1–3A)

7.1 Executive Summary

The risk-driving COCs identified for Site 28 are listed in Table 7-34 and summarized below. The results of Step 3A revealed that there are several COCs posing potential risks to ecological receptors at Site 28 that warrant further evaluation and thus the risk assessment process should continue for this site.

- Antimony, cadmium, copper, lead, mercury, nickel, silver, and zinc in the soil at Site 28 may pose a risk to soil invertebrates and terrestrial plants
- Arsenic, cadmium, copper, lead, and zinc in the swales and along the immediate shoreline of Site 28 may pose a risk to benthic invertebrates and aquatic/wetland plants
- Aluminum, cadmium, iron, lead, silver, and zinc in surface water may pose a risk to water column receptors
- Arsenic, cadmium, lead, mercury, selenium, and zinc pose a risk upper trophic-level receptors using Site 28
- Silver in Mattawoman Creek sediments adjacent to Site 28 (away from the immediate shoreline) may pose a risk to benthic invertebrates and aquatic/wetland plants
- Mercury in the sediments of Mattawoman Creek adjacent to Site 28 (away from the immediate shoreline) may poses a risk to piscivorous birds; however, it is likely that the risk is representative of ambient conditions in the creek and unrelated to Site 28

7.2 Introduction

This section presents a screening-level ecological risk assessment (SERA) and the first step of a BERA for Site 28 at NDWIH, in Charles County, Maryland. This document was prepared in accordance with ecological risk assessment (ERA) guidance provided in USEPA, 1997; NAVFAC, 2001; EFACHES, 2001; and Chief of Naval Operations, 1999.

The Navy ERA process (Chief of Naval Operations, 1999), which consists of eight steps organized into three tiers, is conceptually similar to the eight-step ERA process outlined in USEPA ERA guidance for the Superfund program. The major differences between the Navy ERA policy and the USEPA ERA guidance are: (1) the Navy policy provides clearly defined criteria for exiting the ERA process at specific points, (2) the Navy policy divides Step 3 (the first step of a BERA) into two distinct sub-steps (Steps 3A and 3B), with a potential exit point after Step 3A, and (3) the Navy policy incorporates risk management considerations throughout all tiers of the ERA process, whereas risk management is essentially confined to Step 8 in the USEPA guidance.

The major tiers of the ERA process include:

1. Screening ERA (Tier 1; Steps 1 and 2)
2. Baseline ERA (Tier 2; Steps 3–7)
3. Evaluation of remedial alternatives/risk management (Tier 3; Step 8)

The ERA (Tier 1 or Tiers 1 and 2 combined) provides the remedial project manager the information necessary upon which to make a risk management decision that ensures protection of the environment. Toward this end, the objective of an ERA is to evaluate the potential magnitude of risks to ecological receptors.

Steps 1 and 2 together constitute a SERA, which estimates potential risks based on very conservative assumptions. If potential risks are identified, then the results of the SERA are used to focus subsequent steps of the ERA process on the areas, chemicals, media, and receptors with the highest risk potential.

This section presents Steps 1 and 2 (the SERA) and Step 3A of the BERA. The SERA was conducted to determine if the chemicals detected at Site 28 are present at concentrations that pose a risk to ecological receptors.

This SERA consists of the following subsections:

Subsection	Description
Screening-Level Problem Formulation	Screening level problem formulation includes the site description; chemical sources, fate and transport; available analytical data; ecotoxicity and potential receptors; and the preliminary conceptual site model
Screening-Level Ecological Effects Evaluation	Screening-level ecological effects evaluation introduces the screening values (direct exposure and ingestion screening values)
Screening-Level Exposure Estimation	Presents the exposure point concentrations and dietary intakes (i.e., doses) for higher trophic-level receptors
Screening-Level Risk Calculations	Summarizes the risk calculations
Screening-Level Risk Characterization	Risk characterization; presents COCs for each receptor group
Step 3A—Refinement of Exposure Assumptions	Presents the refinement of the conservative exposure assumptions and evaluation of potential risk-driving COCs
Uncertainty	Discusses potential uncertainties regarding assumptions of exposure and toxicity
Risk Conclusion	Presents risk conclusions

7.3 Screening-Level Problem Formulation

Step 1 constitutes the screening-level problem formulation for the site. The products of problem formulation are the preliminary CSM and the preliminary assessment and measurement endpoints. The purpose of the CSM is to describe how ecological receptors may be exposed to chemical constituents that are present at the site. Development of the CSM requires the identification and description of major habitats and other ecological

receptors, media of concern, and potential contaminant sources. These elements (sources and receptors) and an understanding of how chemicals move through the local environment (transport mechanisms and exposure routes) are used to build the CSM.

7.3.1 Site Description

Section 1.5 contains a description of Site 28.

The 1.8-acre, eastward-sloping site includes a mixture of habitats. The northern portion of Zone A is comprised mostly of tall grass, with some areas of exposed substrate (i.e., soil and gravel). A series of three runoff gullies (i.e., swales) are located in this area of the site. Swales 2 and 3 connect with Swale 1, which conducts stormwater runoff into Mattawoman Creek. The area where Swale 1 discharges to Mattawoman Creek supports a patch of wetland habitat dominated by obligate wetland vegetation.

A fourth swale, in the southern portion of Zone A, collects water via a culvert that runs from west of the dirt road at Site 28 under the road. This drainage also receives runoff from the site, and possibly groundwater discharge. The presence of water and obligate wetlands vegetation during dry periods suggests that water may be permanently present in this drainage, which also discharges to Mattawoman Creek.

The southern portion of Zone A and most of Zone B is mixed hardwood forest. The tree cover in this area is primarily deciduous (e.g., oak, maple, and sweet gum), with a few conifer species. There are several areas (e.g., adjacent to the southern fence line) where a shrubby understory is present. There are also several wetland areas in the forested portion of the site.

The shoreline between Site 28 and Mattawoman Creek is tidally influenced, varies from a sand/gravel to muddy composition, and supports few herbaceous plant species. The littoral zone adjacent to the site is composed of a predominantly sand and gravel substrate along the central portion of the site, in contrast to the fine silty mud substrate immediately upstream and downstream of the site. The abundance of sand and gravel adjacent to the site may be an indication of historical erosion of soils from the site to Mattawoman Creek.

Site 28 contains a number of habitats and, therefore, is likely to support a number of species including mammals, songbirds, raptors, reptiles, and amphibians. The portion of Site 28 that is directly adjacent to Mattawoman Creek likely supports a number of aquatic birds. Based on NAS documentation, no rare, threatened, or endangered species are known to occur on Site 28, but nesting bald eagles have been documented at a different area of NDWIH.

7.3.2 Chemical Sources, Fate, and Transport

The media of concern at Site 28 include soil, sediment, and surface water. Inorganics were elevated in historical Site 28 soil and sediment samples. Surface soil contaminants could migrate to subsurface soil and groundwater by infiltration, and to surface water and sediment by surface water runoff. Groundwater discharge to the surface through soil (i.e., a seep) or surface water could cause contaminant migration to sediment and/or surface water. There is the potential for surface water runoff to carry chemicals adhered to soil particles downgradient into Mattawoman Creek.

7.3.3 Available Analytical Data

Subsection 1.4 presents a summary of all previous investigations at Site 28. Several surface soil sampling events conducted after the IAS suggested that metals were present onsite at concentrations that could pose a risk to ecological receptors.

In October 2000, a sediment sample was collected in Mattawoman Creek just off the shoreline of Site 28 for a TIE associated with Site 42 (Science Applications International Corp., 2001). The sediment sample contained a pore water zinc concentration of 25,000 µg/L.

Tetra Tech NUS has concluded an ongoing study of Mattawoman Creek that included using the Rapid Sediment Screening technology developed by SPAWARS. A review of the data collected for the Mattawoman Creek study indicated that additional site-specific data were required to evaluate Site 28's effect on the environment. Accordingly, additional sediment sampling was conducted to support the Site 28 RI.

In 2003, 35 surface soil samples (not including duplicates) were collected at Site 28 at intervals of 0 to 1 ft to support the ERA (Figure 2-1). These samples were analyzed for inorganics, SVOCs, explosives, and VOCs (Table 7-1):

TABLE 7-1
Surface Soil Samples Collected for the Remedial Investigation
Site 28 RI Report, NDWIH, Indian Head, Maryland

IS28SS02-0001	IS28SS09-0001	IS28SS17-0001	IS28SS24-0001	IS28SS35-0001
IS28SS03-0001	IS28SS10-0001	IS28SS18-0001	IS28SS26-0001	IS28SS36-0001
IS28SS04-0001	IS28SS11-0001	IS28SS19-0001	IS28SS27-0001	IS28SS37-0001
IS28SS05-0001	IS28SS12-0001	IS28SS20-0001	IS28SS28-0001	IS28SS38-0001
IS28SS06-0001	IS28SS13-0001	IS28SS21-0001	IS28SS29-0001	IS28SS40-0001
IS28SS07-0001	IS28SS14-0001	IS28SS22-0001	IS28SS32-0001	IS28SS41-0001
IS28SS08-0001	IS28SS15-0001	IS28SS23-0001	IS28SS33-0001	IS28SS42-0001

Three colocated sediment and surface water samples (not including duplicates) were collected from within the Site 28 boundary (Figure 2-1): one from the confluence of Swales 1, 2, and 3, and two from Swale 4 (Table 7-2).

TABLE 7-2
Sediment and Surface Water Samples Collected onsite for the Remedial Investigation
Site 28 RI Report, NDWIH, Indian Head, Maryland

Confluence of Swales 1, 2, 3	Swale 4
IS28SD03-0503	IS28SD01-0503
IS28SW03-0503	IS28SW01-0503
	IS28SD02-0503
	IS28SW02-0503

Sediment samples were analyzed for inorganics, SVOCs, explosives, and VOCs. Surface water samples were analyzed for total and dissolved metals, SVOCs, explosives, and VOCs.

Twenty-nine sediment samples were collected from 15 locations in Mattawoman Creek adjacent to Site 28 (Figure 2-1). Sediment samples were collected from two depth intervals (0–6 and 6–12 in.) by using a gravity sampler to collect sediment cores at each station. Only 29 samples were collected because it was not possible to obtain a 6-to-12-in. sample at location IS28SD08 because refusal was encountered at 6 in. below the sediment/water interface. The surface sediment samples (0–6 in.) were collected to support the ERA. The subsurface sediment samples (6–12 in.) were collected to aid in determining the nature and extent and potential off-site migration of chemicals into Mattawoman Creek. Five sampling locations were located along the immediate Site 28 shoreline, five sampling locations were located in the channel, and five sampling locations were located in the littoral zone along the depositional bar across from Site 28. The channel samples could not be collected directly in the center of the channel because the substrate was too hard to obtain a sediment core from this area. Therefore, the channel samples were collected closer to the site than originally intended in some cases, and farther downstream than originally intended in one case (IS28SD06). The sampling locations were moved until a suitable substrate was encountered to ensure collection of a sediment core of at least 12 in. The sample locations shown on Figure 2-1 are actual locations as recorded with a differential GPS unit. All samples were all analyzed for inorganics. In addition, at three stations, one from each sampling zone (i.e., Site 28 shoreline, channel, and depositional bar), the surface and subsurface samples were analyzed for SVOCs, and explosives (Table 7-3).

TABLE 7-3
Mattawoman Creek Sediment Samples Collected for the Remedial Investigation
Site 28 RI Report, NDWIH, Indian Head, Maryland

IS28SD010006	**IS28SD020006**	IS28SD030006	IS28SD040006	IS28SD050006
IS28SD010612	**IS28SD020612**	IS28SD030612	IS28SD040612	IS28SD050612
IS28SD060006	IS28SD070006	IS28SD080006	**IS28SD090006**	IS28SD100006
IS28SD060612	IS28SD070612	—	**IS28SD090612**	IS28SD100612
IS28SD110006	IS28SD120006	IS28SD130006	IS28SD140006	IS28SD150006
IS28SD110612	IS28SD120612	IS28SD130612	IS28SD140612	IS28SD150612

Bold text indicates a sample that was analyzed for SVOCs and explosives in addition to inorganics.

The analytical chemistry results for these samples are summarized in Tables 7-4 through 7-7.

7.3.4 Ecotoxicity and Potential Receptors

Analytical results for Site 28 samples indicate that inorganics, SVOCs, explosives, and VOCs are present in site soil and sediment (Tables 7-4 and 7-5) and that inorganics and nitrobenzene are present in site surface water (Table 7-6). Results indicate that inorganics and SVOCs are present in Mattawoman Creek sediments adjacent to Site 28 (Table 7-7). As such, these chemical classes—particularly inorganics, because they are associated with

historical activities at the site—are considered those with the highest likelihood of posing risk to ecological receptors.

All of the TAL metals but thallium were detected in surface soil at Site 28. Of these, arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc bioaccumulate through the foodweb. Exposure to these inorganics could be important for upper trophic level receptors that forage at the site. There are a variety of toxic mechanisms associated with metals. Zinc is known to be a present at elevated concentrations at Site 28, likely due to the historical zinc recovery furnace operation. Therefore, the ecotoxicity of this metal is discussed in detail below.

In the environment, the most common form of zinc is in the +2 oxidation state. Zinc is highly reactive in soils and can be adsorbed to clay minerals or metallic oxides (Sachdev et al., 1992). The active zinc species in the adsorbed state is the singly charged zinc hydroxide species (i.e., Zn(OH) +) (Sanders and El Kherbawy, 1987). This metal forms stable complexes with organic substances such as humic and fulvic acids. Metallic zinc is insoluble, but the solubilities of zinc compounds range from insoluble (oxides, carbonates, phosphates, silicates) to extremely soluble (sulphates and chlorides) (Environment Canada, 1996).

Zinc solubility and mobility increases with decreasing soil pH. In soils with pH > 7.7, $Zn(OH)_2$ becomes the dominant form and solubility is very low. Zinc in a soluble form, such as zinc sulfate, is fairly mobile in most soils. However, relatively little zinc in most soils is in soluble form, and mobility is, therefore, limited by a slow rate of dissolution. Low pH (<7) and high ionic strength of the leaching solution favor desorption (USEPA, 1987; Saeed and Fox, 1977).

Zinc toxicity to earthworms (*Eisenia fetida*) was evaluated through studies with a range of artificial soils having varying organic content and pH (Spurgeon and Hopkin, 1996). In general, mortality increased as zinc concentrations increased, and a decrease in pH and organic matter (i.e., within the range tested) tended to decrease zinc toxicity. Depending on soil chemistry, the estimated EC_{50} values (cocoon production) for this study ranged from 136 to 592 mg/kg.

Further studies evaluating the effects of zinc (as zinc acetate) in horse manure on *E. fetida*, showed reduced cocoon production (Malecki et al., 1982). Following an 8-week exposure, 2,000 mg/kg resulted in a 36 percent decrease in cocoon production, while 1,000 mg/kg had no effects. Following a 20-week exposure, 5,000 mg/kg resulted in a 53 percent reduction in cocoon production, while 2,500 mg/kg had no effect.

Studies in which adult earthworms *(E. fetida*) were exposed to zinc (as $Zn(NO_3)$) in artificial soil (pH 6) were used to estimate LC_{50} values (Neuhauser et al., 1985). Following 14 days of exposure, an LC_{50} value of 662 mg/kg was calculated.

Eisenia fetida exposed to zinc (as zinc nitrate) exhibited lethal and sublethal (e.g., growth effects) effects (Spurgeon and Hopkin, 1995). Zinc exposure resulted in estimated LC_{50} and EC_{50} (growth) values of 216 and 400 mg/kg, respectively.

Following zinc exposure in soil, the terrestrial isopod, *Porcellio scaber* exhibited prolonged molting (Drobne and Strus, 1996). The NOEL for *P. scaber* molting was 250 mg/kg.

In aquatic systems, low alkalinity, low hardness, and high pH promote the formation of bioavailable species of zinc (Paulauskis and Winner, 1988; Schubauer-Berigan et al., 1993). Zinc is an essential trace element to both plants and animals. The amount of bioavailable zinc will be determined by the amount of zinc present, and in what form it exists (e.g., soluble or insoluble). Zinc is more bioavailable in acidic soil conditions, particularly at pH less than 5 (Duquette and Henershot, 1990).

Studies using a variety of benthic macroinvertebrate species have been used to document the effects of zinc exposure in the aquatic environment. Two water flea species were exposed to zinc for 2 days and have shown somewhat varying sensitivities. The 2-day LC_{50} values for *Ceriodaphnia dubia* and *Daphnia magna* were 0.13 (Belanger and Cherry, 1990) and 1.59 milligrams per liter (mg/L) (Kazlauskiene et al., 1994), respectively. In a 3-day study where common toad (*Bufo arenarum*) tadpoles were exposed to a range of zinc levels (i.e., 4-32 mg/L), 65 percent mortality resulted at the 32 mg/L exposure level (Herkovits and Perez-Coll, 1991). Twenty-four hours of exposure to 39 mg/L zinc resulted in 100 percent mortality for Western toad (*Bufo boreas*) larvae, while all larvae still metamorphosed following exposure to 0.1 mg/L over the same time period (Porter and Hakanson, 1976). Exposure to 15 mg/L of $ZnSO_4$ yielded no toxicity for African clawed frog (*Xenopus laevis*) tadpoles (Woodall et al., 1988), while exposure to 20 mg/L resulted in 4-15 percent mortality. Potential receptors at Site 28 could include organisms that have significant direct contact with the soil (e.g., plants and soil invertebrates), sediment (e.g., benthic invertebrates), or surface water (e.g., aquatic invertebrates), as well as those upper trophic level species that forage in soil, sediment, or surface water or on organisms that have a high level of contact with these media.

7.3.5 Preliminary Conceptual Site Model

Information on site ecology, chemical sources, potential receptors, and the fate and transport of chemicals is used to develop a preliminary CSM for the site. This CSM assumes that, under the future use scenario, all areas of the site could be accessible to ecological receptors.

7.3.5.1 Exposure Pathways

The primary source of chemicals in soil and sediment at Site 28 is believed to be in areas where wastes and materials were stored or burned in the past, or where contaminated soil, sediment, or groundwater has been transported and accumulated. Organisms inhabiting Site 28 might be exposed to chemicals present at the site through the following routes:

- Direct contact with soil
- Direct contact with sediment
- Direct contact with surface water
- Ingestion of soil
- Ingestion of sediment
- Ingestion of surface water
- Root uptake (plants)
- Ingestion of biota that have accumulated chemicals from the soil, sediment, or surface water

Inhalation is not an exposure route of concern at Site 28 because no significant VOC contamination has been detected at the site.

7.3.5.2 Assessment and Measurement Endpoints

The conclusion of the problem formulation stage includes the selection of assessment and measurement endpoints, based on the preliminary CSM. Endpoints in the SERA define ecological attributes that are to be protected (assessment endpoints) and measurable characteristics of those attributes (measurement endpoints) that can be used to gauge the degree of impact that has occurred or could occur. Assessment endpoints most often relate to attributes of biological populations or communities, and are intended to focus the risk assessment on particular components of the ecosystem that could be adversely affected by contaminants from the site (USEPA, 1997). Assessment endpoints contain an entity (e.g., fish-eating birds) and an attribute of that entity (e.g., survival rate).

Because of the complexity of natural systems, it is generally not possible to directly assess the potential impacts to all ecological receptors present within an area. Therefore, receptor species (e.g., great blue heron) or species groups (e.g., fish) are often selected as surrogates to evaluate potential risks to larger components of the ecological community (feeding guilds; e.g., piscivorous birds) represented in the assessment endpoints (e.g., survival and reproduction of piscivorous birds). Selection criteria typically include those species that:

- Are known to occur or are likely to occur at the site
- Have a particular ecological, economic, or aesthetic value
- Are representative of taxonomic groups, life history traits, and/or trophic levels in the habitats present at the site for which complete exposure pathways are likely to exist
- Can, because of toxicological sensitivity or potential exposure magnitude, be expected to represent potentially sensitive populations at the site
- Have sufficient ecotoxicological information available on which to base an evaluation

Based on the habitats and types of contaminants present, 16 assessment endpoints were chosen to evaluate the risk to ecological receptor populations from chemicals at Site 28. Each assessment endpoint and corresponding representative species or community is described below.

Terrestrial Growth, Survival, and Reproduction. *Soil invertebrate communities*—Soil invertebrates promote soil fertility by breaking down organic matter and releasing nutrients. They also improve aeration, drainage, and aggregation of soil, and serve as a forage base for many terrestrial species. The soils at the site will support fewer insectivorous birds and mammals if chemical concentrations are limiting the survival and reproduction of soil invertebrates. A representative species was not selected to represent this group. The set of screening values used to assess soil invertebrates was based on toxicity test information from a variety of species. The process used to select screening values is intended to be protective of the soil invertebrate community.

Terrestrial plant communities—Plant communities are primary producers and provide a substantial portion of the food in terrestrial communities. They are especially important to herbivorous birds and mammals. Plants also provide cover and nesting habitat for a variety of animals. A representative species was not selected to represent this group. The set of screening values used to assess terrestrial plants is based on toxicity test information from a

variety of species. The process used to select screening values is intended to be protective of the terrestrial plant community.

Avian terrestrial herbivores—These receptors consume mainly seeds from cultivated fields or weeds. They are first order consumers, susceptible to exposure to chemicals present in plant material. The mourning dove (*Zenaidura macoura*) was chosen to represent this assessment endpoint. Mourning doves live in a variety of habitats, including woodlands, open prairies, and mountain regions. They forage in fields, orchards, or other open weedy areas where seeds are can be gleaned readily (Martin et. al., 1951).

Avian terrestrial insectivores—These receptors consume insects or other soil invertebrates. They are second order consumers, and susceptible to exposure to bioaccumulative chemicals. Many insectivores also have significant contact with soils. American robin (*Turdus migratorius*) was chosen to represent this assessment endpoint. Robins live in a variety of habitats, including woodlands, swamps, suburbs, and parks. They forage along the ground for ground-dwelling invertebrates and search for fruit and foliage-dwelling insects in low tree branches (Malmborg and Willson, 1988).

Avian terrestrial carnivores—These receptors are top level predators and are susceptible to bioaccumulative chemicals, especially those that have the potential to biomagnify through terrestrial food chains. The screech owl was chosen to represent this assessment endpoint. Screech owls inhabit woods, swamps, and parks, and eat mice, insects, amphibians, and birds (Stokes and Stokes, 1996). They commonly nest in tree cavities and woodpecker holes. The screech owl represents other avian terrestrial carnivores that might inhabit the site such as the American kestrel and red-tailed hawk.

Mammalian terrestrial herbivores—These receptors are primary consumers, feeding on plants. Many of the species in this group are prey for upper trophic levels. The meadow vole was chosen to represent this assessment endpoint. The meadow vole inhabits areas where there is good grass cover. It consumes primarily shoots, grasses, and bark (USEPA, 1993).

Mammalian terrestrial insectivores—These receptors are second order consumers and susceptible to exposure to bioaccumulative chemicals. Many insectivores also have significant contact with soils. The northern short-tailed shrew was chosen to represent this assessment endpoint. Shrews are small primarily vermivorous and insectivorous mammals that inhabit areas with vegetative cover. They have high metabolic rates and may consume their body weight in food each day (USEPA, 1993). This assessment endpoint is considered to be protective of omnivorous, small mammals, such as the white-footed mouse.

Mammalian terrestrial carnivores—These receptors are top level predators and are susceptible to exposure to bioaccumulative chemicals, especially those that have the potential to biomagnify through terrestrial foodchains. The gray fox was chosen to represent this assessment endpoint. The gray fox inhabits woody and brushy habitats, consuming small mammals and birds, carion, invertebrates, fruits, berries, and corn (Jones and Birney, 1988). This assessment endpoint represents other omnivorous mammals of this size such as the red fox.

Wetland and Aquatic Habitat Growth, Survival, and Reproduction. *Benthic invertebrate communities* – Benthic invertebrates serve as a forage base for many aquatic and semiaquatic species. They also play an important role in the processing and breakdown of organic matter in aquatic systems (USEPA, 1989). Because they have significant direct contact with, and may even consume, sediment, benthic invertebrates may be highly exposed to contaminants and develop body burdens. A benthic invertebrate community limited by chemical contamination would support fewer aquatic birds, fish, and amphibians. A representative species was not selected to represent this group. The set of screening values used to assess benthic invertebrates involves toxicity test information on a variety of species. The process used to select screening values is intended to be protective of the community.

Aquatic and wetland plant communities – Plant communities in aquatic and wetland systems are primary producers and serve as a food base for herbivorous and omnivorous amphibians, reptiles, fish, birds, and mammals. Plants also provide cover and nesting habitat for a variety of aquatic and wetland organisms. A representative species was not selected to represent this group. The set of screening values used to assess aquatic and wetland plants involves toxicity test information on a variety of species. The process used to select screening values is intended to be protective of the community.

Water column receptors – These receptors include fish, larval amphibians, aquatic insects, and other invertebrates. These organisms are susceptible to direct chemical exposure. The community serves as a prey base for many terrestrial and semiaquatic organisms. A representative species was not selected to represent this group. The set of screening values used to assess water column receptors involves toxicity test information on a variety of species. The process used to select screening values is intended to be protective of the community.

Avian aquatic/wetland omnivores – These receptors are mid-level consumers and are thus susceptible to bioaccumulative chemicals, especially those that have the potential to biomagnify through aquatic foodchains. The mallard was chosen to represent this assessment endpoint. Mallards utilize shallow wetland habitats, preferring freshwater to saltwater or brackish water bodies. Their diet consists mainly of aquatic plants, but aquatic insects, mollusks (mostly snails and small bivalves) and crustaceans are also important dietary components. Through foraging, mallards may ingest soil and sediment.

Avian wetland/open water insectivores – These receptors are mid-level consumers and are susceptible to exposure to bioaccumulative chemicals, especially those that have the potential to biomagnify through aquatic foodchains. The tree swallow was chosen to represent this endpoint. Tree swallows are cavity-nesting birds that are limited by the availability of suitable nesting sites such as abandoned cavities in standing dead tress. They utilize open areas during most of the year. During the breeding season, these areas include streams, rivers, lakes, ponds, marshes, shorelines, coastal regions, wet meadows, fields, and wooded swamps. Suitable breeding habitat requires nest cavities, usually near water. Tree swallows feed almost exclusively on flying insects but will also eat some berries and seeds, especially in winter. Tree swallows forage from dawn to dusk in open areas over water or dry ground.

Avian wetland/open water piscivores – These receptors are top level consumers and are thus susceptible to bioaccumulative chemicals, especially those that have the potential to

biomagnify through aquatic foodchains. The great blue heron was chosen to represent this endpoint. Great blue heron usually nest in colonies near their foraging habitat. These birds prefer the shallow edges of freshwater and saltwater lakes, rivers, and wetlands, especially those areas that support their major food source of small fish and amphibians. This assessment endpoint represents other wetland/open water piscivores such as the kingfisher.

Mammalian aquatic/wetland herbivores – These receptors are first-order consumers. The muskrat was chosen to represent this assessment endpoint. Muskrats live in both freshwater and saltwater aquatic and wetland habitats by excavating dens or building lodges. Muskrats feed nocturnally on aquatic plants and may ingest sediment. Muskrats are preyed upon by birds and mammals.

Mammalian aquatic/wetland carnivores – These receptors are top level predators and are susceptible to exposure to bioaccumulative chemicals, especially those that have the potential to biomagnify through aquatic foodchains. The mink was chosen to represent this assessment endpoint. Mink are particularly sensitive to polychlorinated biphenyls (PCBs) and similar chemicals. Mink live in both freshwater and saltwater aquatic and wetland habitats and prefer irregular shorelines. Mink are opportunistic and feed nocturnally on whatever prey are available including small mammals, aquatic plants and invertebrates, fish, and amphibians. This assessment endpoint is considered to be protective of mammalian aquatic/wetland omnivores such as the raccoon.

The corresponding measurement endpoints associated with each assessment endpoint were defined as follows:

Terrestrial Habitats

Assessment Endpoints	Measurement Endpoints
Impact on growth, survival, and reproduction of the soil invertebrate community.	Comparison of HQs for soil invertebrates (earthworms) to a target HQ of 1. Medium-specific HQs are calculated for individual contaminants by dividing the soil concentration by a soil benchmark that is intended to be protective of soil invertebrates.
Impact on growth, survival, and reproduction of the plant community.	Comparison of HQs for terrestrial plants to a target HQ of 1. Medium-specific HQs are calculated for individual contaminants by dividing the soil concentration by a soil benchmark that is intended to be protective of terrestrial plants.
Impact on growth, survival, and reproduction of avian terrestrial herbivores.	Comparison of HQs for mourning dove to a target HQ of 1. Receptor-specific HQs are calculated for individual contaminants by dividing an estimated level of exposure (dose) by a screening toxicity value that is associated with no adverse effects.
Impact on growth, survival, and reproduction of avian terrestrial insectivores.	Comparison of HQs for American robin to a target HQ of 1. Receptor-specific HQs are calculated for individual contaminants by dividing an estimated level of exposure (dose) by a screening toxicity value that is associated with no adverse effects.
Impact on growth, survival, and reproduction of avian terrestrial carnivores.	Comparison of HQs for screech owl to a target HQ of 1. Receptor-specific HQs are calculated for individual contaminants by dividing an estimated level of exposure (dose) by a screening toxicity value that is associated with no adverse effects.
Impact on growth, survival, and reproduction of mammalian terrestrial herbivores.	Comparison of HQs for meadow vole to a target HQ of 1. Receptor-specific HQs are calculated for individual contaminants by dividing an estimated level of exposure (dose) by a screening toxicity value that is associated with no adverse effects.

Terrestrial Habitats

Assessment Endpoints	Measurement Endpoints
Impact on growth, survival, and reproduction of mammalian terrestrial insectivores.	Comparison of HQs for short-tailed shrew to a target HQ of 1. Receptor-specific HQs are calculated for individual contaminants by dividing an estimated level of exposure (dose) by a screening toxicity value that is associated with no adverse effects.
Impact on growth, survival, and reproduction of mammalian terrestrial carnivores.	Comparison of HQs for gray fox to a target HQ of 1. Receptor-specific HQs are calculated for individual contaminants by dividing an estimated level of exposure (dose) by a screening toxicity value that is associated with no adverse effects.

Wetland and Aquatic Habitats

Assessment Endpoints	Measurement Endpoints
Impact on the growth, survival, and reproduction of benthic invertebrate communities.	Comparison of HQs for benthic invertebrates to a target HQ of 1. Media-specific HQs are calculated for individual contaminants by dividing the sediment concentration by a sediment screening value that is intended to be protective of benthic invertebrates.
Impact on growth, survival, and reproduction of aquatic and wetland plant communities.	Comparison of HQs for aquatic plants to a target HQ of 1. Media-specific HQs are calculated for individual contaminants by dividing the sediment concentration by a sediment screening value that is intended to be protective of aquatic/wetland plants.
Impact on growth, survival, and reproduction of water column receptors.	Comparison of HQs for water column receptors to a target HQ of 1. Media-specific HQs are calculated by dividing the surface water concentration by a surface water screening value that is intended to be protective of water column organisms.
Impact on growth, survival, and reproduction of avian aquatic/wetland omnivores.	Comparison of HQs for mallard to a target HQ of 1. Receptor-specific HQs are calculated for individual contaminants by dividing an estimated maximum level of exposure by a screening toxicity value that is associated with no adverse effects.
Impact on growth, survival, and reproduction of avian wetland insectivores.	Comparison of HQs for tree swallow to a target HQ of 1. Receptor-specific HQs are calculated for individual contaminants by dividing an estimated maximum level of exposure by a screening toxicity value that is associated with no adverse effects.
Impact on growth, survival, and reproduction of avian wetland/open water piscivores.	Comparison of HQs for great blue heron to a target HQ of 1. Receptor-specific HQs are calculated for individual contaminants by dividing an estimated maximum level of exposure by a screening toxicity value that is associated with no adverse effects.
Impact on growth, survival, or reproduction of mammalian aquatic/wetland herbivores.	Comparison of HQs for muskrat to a target HQ of 1. Receptor-specific HQs are calculated for individual contaminants by dividing an estimated maximum level of exposure by a screening toxicity value that is associated with no adverse effects.
Impact on growth, survival, or reproduction of mammalian aquatic/ wetland carnivores.	Comparison of HQs for mink to a target HQ of 1. Receptor-specific HQs are calculated for individual contaminants by dividing an estimated maximum level of exposure by a screening toxicity value that is associated with no adverse effects.

Although potentially complete exposure pathways exist for reptiles and amphibians, they were not specifically selected as receptors. Use of ambient water quality criteria (AWQC) is protective of the larval stages of amphibians. Information of the toxicological effects of

chemicals on adult amphibians and reptiles via ingestion is limited. Reptiles and amphibians are not likely to be more sensitive to chemical exposures than other receptor groups that are evaluated in the risk assessment (see A.T. Kearney (1997) for a discussion).

7.4 Screening-Level Effects Evaluation

The purpose of the screening-level effect evaluation is to establish chemical exposure levels (screening values) that represent conservative thresholds for adverse ecological effects.

7.4.1 Medium-Specific Screening Values

Medium-specific screening values are established for ecologically relevant media, including surface water, surface sediment, and surface soil. These values are intended to protect receptors from direct exposure. Screening values and their sources are presented in Appendix I.

For some chemicals, there are sediment and soil screening values for both plants and animals (e.g., soil fauna and soil flora). Where both were available and there were no significant quality differences (e.g., one is an acute value while the other is a chronic value), the lower (i.e., more conservative) of the two was selected for use in the SERA.

The screening values used in the ERA were based those recommended by the Region 3 Biological Technical Assistance Group (BTAG) (USEPA, 1995). Where possible, additional screening values available from sources approved by the BTAG were used to supplement the list.

7.4.2 Ingestion Screening Values

Ingestion screening values for the bioaccumulative chemicals identified in USEPA (2000) were obtained from the literature for use in ingestion-based foodweb modeling. Ingestion screening values are presented in Tables 7-8 and 7-9 for mammals and birds, respectively. Toxicological information for wildlife species most closely related to the receptor species was used, where available, but was supplemented by laboratory studies of non-wildlife species (e.g., laboratory mice) where necessary. Toxicity studies involving long term (i.e., chronic) exposure and the ingestion route were used preferentially. Growth and reproduction were emphasized as toxicological endpoints since they are the most relevant to maintaining viable populations and because they are generally the most studied chronic toxicological endpoints for ecological receptors.

For each chemical and each receptor, the literature was reviewed for a NOAEL. In the event that only a LOAEL was available, a NOAEL was calculated by dividing the LOAEL by a factor of 10. This approach is recommended by USEPA (1997). When an LD_{50} (lethal dose at which there is 50 percent mortality) was the only available endpoint, it was divided by an uncertainty factor of 100 to obtain the NOAEL. No body weight adjustments were made for receptors. The ingestion screening values are expressed as milligrams of the chemical per kilogram body weight of the receptor per day (mg/kg-BW/day).

7.5 Screening-Level Exposure Estimate

Maximum detected concentrations in soil, sediment, and surface water were used as the basis for estimating the chemical exposure to receptor communities and species. The maximum detection limit for contaminants that were analyzed for but not detected were also compared to media-specific screening values and used for trophic modeling. This was done to ensure that detection limits were similar to chemical levels that are not expected to be associated with an impact to ecological receptors. For samples with duplicate analyses, the higher concentration was used in the screening (i.e., when an analyte was detected in both the parent and duplicate sample or when an analyte was not detected in either sample). In cases where an analyte was detected in one result but not the other, the detected value was used in the assessment.

7.5.1 Exposure Point Concentrations

Exposure point concentrations for foodweb modeling of terrestrial upper trophic-level receptors (i.e., chemical concentrations in terrestrial plants/terrestrial invertebrates) were estimated using the methodology and models described below. As previously mentioned, only those constituents listed in Table 4-2 in USEPA (2000) were included in the evaluation of bioaccumulation.

Maximum measured media concentrations were used as exposure point concentrations for screening-level exposure estimation and foodweb modeling. Exposure point concentrations for terrestrial and aquatic prey items (plants, soil invertebrates, small mammals, fish/frogs, and aquatic invertebrates) are estimated using bioaccumulation models and maximum measured media concentrations. The models used to derive these estimates are described below.

7.5.1.1 Terrestrial Plants

Tissue concentrations in the aboveground vegetative portion of terrestrial plants were estimated by multiplying the maximum measured surface soil concentration for each chemical by chemical-specific soil-to-plant bioconcentration factors (BCFs) obtained from the literature (Table 7-10). The BCF values used were based on root uptake from soil and on the ratio between dry-weight soil and dry-weight plant tissue. Literature values based on the ratio between dry-weight soil and wet-weight plant tissue were converted to a dry-weight basis by dividing the wet-weight BCF by the estimated solids content for terrestrial plants (15 percent [0.15]; Sample et al., 1997).

For inorganic chemicals without literature based BCFs, a soil-to-plant BCF of 1.0 was assumed. For organic chemicals without literature based BCFs, soil-to-plant BCFs were estimated using the algorithm provided by Travis and Arms (1988):

$$\log B_v = 1.588 - (0.578)(\log K_{ow})$$

where: B_v = Soil-to-plant BCF (unitless; dry weight basis)
K_{ow} = Octanol-water partitioning coefficient (unitless)

The log K_{ow} values used in the calculations were obtained mostly from USEPA (1995b; 1996) and are listed in Table 7-11.

7.5.1.2 Earthworms

Tissue concentrations in soil invertebrates (earthworms) were estimated by multiplying the maximum measured surface soil concentration for each chemical by chemical-specific BCFs or BAFs obtained from the literature (Table 7-10). BCFs are calculated by dividing the concentration of a chemical in the tissues of an organism by the concentration of that same chemical in the surrounding environmental medium (in this case, soil) without accounting for uptake via the diet. BAFs consider both direct exposure to soil and exposure via the diet. Since earthworms consume soil, BAFs are more appropriate values and are used in the food web models when available. BAFs based on depurated analyses (soil was purged from the gut of the earthworm prior to analysis) are given preference over undepurated analyses when selecting BAF values since direct ingestion of soil is accounted for separately in the food web model.

The BCF/BAF values used were based on the ratio between dry-weight soil and dry-weight earthworm tissue. Literature values based on the ratio between dry-weight soil and wet-weight earthworm tissue were converted to a dry-weight basis by dividing the wet-weight BCF/BAF by the estimated solids content for earthworms (16 percent [0.16]; USEPA 1993). For inorganic chemicals without available measured BAFs or BCFs, an earthworm BAF of 1.0 was assumed.

7.5.1.3 Small Mammals

Whole-body tissue concentrations in small mammals (shrews, voles, and/or mice) were estimated using one of two methodologies. For chemicals with literature-based soil-to-small mammal BCFs, the small mammal tissue concentration was obtained by multiplying the maximum measured surface soil concentration for each chemical by a chemical-specific soil-to-small mammal BCF obtained from the literature. The BCF values used were based on the ratio between dry-weight soil and whole-body dry-weight tissue. Literature values based on the ratio between dry-weight soil and wet-weight tissue were converted to a dry-weight basis by dividing the wet-weight BCF by the estimated solids content for small mammals (32 percent [0.32]; USEPA 1993). BCFs for shrews were those reported in Sample et al. (1998) for insectivores (or for general small mammals if insectivore values were unavailable), for voles were those reported for herbivores, and for mice were those reported for omnivores. The soil-to-small mammal BAFs used are shown in Table 7-12.

For chemicals without soil-to-small mammal BCF values, an alternate approach was used to estimate whole-body tissue concentrations. Because most chemical exposure for these small mammal species is via the diet, it was assumed that the concentration of each chemical in the small mammal's tissues was equal to the chemical concentration in its diet, that is, a *diet* to whole-body BAF (wet-weight basis) of one was assumed. The use of a diet to whole-body BAF of one is likely to result in a conservative estimate of chemical concentrations for chemicals that are not known to biomagnify in terrestrial food chains (e.g., aluminum). For chemicals that are known to biomagnify (e.g., PCBs), a diet to whole-body BAF value of one likely results in a realistic estimate of tissue concentrations based on reported literature values.

7.5.1.4 Aquatic Plants

Tissue concentrations in the aboveground vegetative portion of aquatic plants were estimated using the same methodologies as described above for terrestrial plants except that maximum sediment (not soil) concentrations were used in the calculation. Sediment-to-plant BCFs are presented in Table 7-13.

7.5.1.5 Aquatic Invertebrates

Tissue concentrations in aquatic invertebrates were estimated by multiplying the maximum measured sediment concentration for each chemical by chemical-specific sediment-to-invertebrate BCFs obtained from the literature (Table 7-14). The BCF values used were based on the ratio between dry-weight sediment and dry-weight invertebrate tissue. BCFs based on depurated analyses (sediment was purged from the gut of the organism prior to analysis) were given preference over undepurated analyses when selecting BCF values since direct ingestion of sediment is accounted for separately in the food web model.

Literature values based on the ratio between dry-weight sediment and wet-weight invertebrate tissue were converted to a dry-weight basis by dividing the wet-weight BCF by the estimated solids content for aquatic invertebrates (21 percent [0.21]; USEPA 1993). For chemicals without literature based sediment-to-invertebrate BCFs, a BCF of 1.0 was assumed.

7.5.1.6 Aquatic Vertebrates

Tissue concentrations in whole-body fish and frogs were estimated by multiplying the maximum measured sediment concentration for each chemical by chemical-specific sediment-to-vertebrate BCFs obtained from the literature (Table 7-13 and 7-14). The BCF values used were based on the ratio between dry-weight sediment and dry-weight tissue. Literature values based on the ratio between dry-weight sediment and wet-weight tissue were converted to a dry-weight basis by dividing the wet-weight BCF by the estimated solids content for aquatic vertebrates (25 percent [0.25]; USEPA 1993). For chemicals without literature based sediment-to-aquatic vertebrate BCFs, a BCF of 1.0 was assumed.

7.5.2 Dietary Intakes

For receptor species used in foodweb modeling, the dietary intake (i.e., dose) of each chemical (in mg chemical per kg of body weight per day) was calculated by using species-specific life history information, where available, and the following formula (modified from USEPA [1993]):

where:

DI_x	=	Dietary intake for chemical x (mg chemical/kg body weight/day)
FIR	=	Food ingestion rate (kg/day, dry-weight)
FC_{xi}	=	Concentration of chemical x in food item i (mg/kg, dry weight)
PDF_i	=	Proportion of diet composed of food item i (dry weight basis)
SC_x	=	Concentration of chemical x in soil/sediment (mg/kg, dry weight)
PDS	=	Proportion of diet composed of soil/sediment (dry weight basis)
BW	=	Body weight (kg, wet weight)

Receptor-specific values used as inputs to this equation are provided in Table 7-15. Minimum body weights, and maximum ingestion rates for food, water, and soil/sediment were used to develop exposure estimates. Incidental ingestion of soil/sediment was also included when calculating the total level of exposure.

7.6 Screening-Level Risk Estimation

The screening-level risk calculation is the final step in the SERA (Step 2). In this step, the maximum exposure concentrations for abiotic media (surface soil, sediment, and surface water) or exposure doses for upper trophic-level receptor species are compared with the corresponding screening values to derive screening risk estimates. The outcome of this step is a list of COPCs for each media-pathway-receptor combination.

7.6.1 Selection of COPCs

COPCs are selected using the HQ method. HQs are calculated by dividing the chemical concentration in the medium being evaluated by the corresponding medium-specific screening value or by dividing the exposure dose by the corresponding ingestion screening value. For nondetected chemicals, the maximum reporting limit is used as the sample concentration (direct exposure) and as the basis for exposure doses (food web models). Chemicals with HQs greater than or equal to 1 are considered COPCs in the SERA.

HQs exceeding one indicate the potential for risk since the chemical concentration or dose (exposure) exceeds the screening value (effect). However, screening values and exposure estimates are derived using intentionally conservative assumptions such that HQs greater than or equal to one do not necessarily indicate that impacts are occurring. Rather, it identifies chemical-pathway-receptor combinations requiring further evaluation. HQs that are less than one indicate that risks are unlikely (USEPA, 1997), enabling a conclusion of no unacceptable risk to be reached with high confidence.

Chemicals that were selected as COPCs at the conclusion of the SERA were as follows:

- Detected chemicals with an HQ in excess of 1 (direct exposure or food web);
- Nondetected chemicals with an HQ in excess of 1 (direct exposure or food web); and
- Detected chemicals that could not be evaluated due to lack of a soil screening value or lack of an appropriate NOAEL.

Chemicals that are not detected and do not have either direct exposure or ingestion screening values were not quantitatively evaluated and were not considered COPCs.

7.6.1.1 Direct Exposure Screening

Surface Soil. Maximum surface soil concentrations are compared to soil screening values in Table 7-16. Based upon this comparison, 16 inorganic chemicals had HQs exceeding one based on detected maximum concentrations and were identified as COPCs (Table 7-16). Although thallium was not detected, it was also retained as a COPC because the maximum reporting limit exceeded the direct exposure screening value (Table 7-16).

Fifty SVOCs were identified as COPCs (Table 7-16). Of these, 22 had detected maximum concentrations that exceeded screening values; 26 were retained as COPCs because they were detected but screening values were not available (Table 7-16). Two SVOCs were not detected but had HQs exceeding one based on maximum reporting limits and thus were also identified as COPCs (Table 7-16).

Five explosives and five VOCs were retained as COPCs because they were detected but screening values were not available (Table 7-16).

Onsite Sediment. The sediment samples included in the onsite sediment screening included the three surface sediment samples (0–6 in.) collected from the onsite swales (IS28SD0503 through IS28SD0503) and the five surface sediment samples (IS28SD01 through IS28SD05) collected along the shoreline of Mattawoman Creek (Figure 2-1). Maximum sediment concentrations for these sediment samples are compared to sediment screening values in Table 7-17. Based on this comparison, 14 inorganic chemicals were identified as COPCs (Table 7-17). Of these, 9 had detected maximum concentrations that exceeded screening values; 5 were retained as COPCs because they were detected but screening values were not available (Table 7-17).

Nineteen SVOCs were identified as COPCs (Table 7-17). Of these, one (n-nitrosodiphenylamine) had a detected maximum concentration that exceeded the screening value; one (2,4-dinitrotoluene) was retained as a COPC because it was detected but no screening value was available (Table 7-17). Seventeen nondetected SVOCs had HQs exceeding one based on maximum reporting limits and were also identified as COPCs (Table 7-17).

Four explosives and 4 VOCs were identified as COPCs because they were detected but screening values were not available (Table 7-17).

Three VOCs, although not detected, had HQs exceeding one based on maximum reporting limits and were also retained as COPCs (Table 7-17).

Surface Water. Maximum surface water concentrations for the three surface water samples collected from the swales are compared to surface water screening values in Table 7-18. Based on the comparison of total metals to surface water screening values, nine inorganics were identified as COPCs. Of these, five (i.e., cadmium, copper, iron, lead, and zinc) had HQs exceeding one based on detected maximum concentrations, and four (i.e., aluminum, antimony, selenium and silver) were not detected, but had maximum reporting limits that exceeded screening values.

Based on the comparison of dissolved metals to surface water screening values, eight inorganics were identified as COPCs. Of these, two (i.e., cadmium and zinc) had HQs equaling or exceeding one based on detected maximum concentrations. Six (i.e., aluminum, antimony, copper, lead, selenium, and silver) were not detected, but had maximum reporting limits that exceeded screening values.

No SVOCs were detected in the surface water samples, although fifteen were identified as COPCs because their maximum reporting limits exceeded screening values.

No explosives were identified as COPCs in surface water. Nitrobenzene was the only explosive detected. It was detected in one of the three samples at a concentration (i.e., 0.15 µg/L) well below the screening value of 27,000 µg/L.

No VOCs were detected in the surface water samples, but one, carbon disulfide, was identified as a COPC because the maximum reporting limit for this compound exceeded the screening value.

Mattawoman Creek Sediment. Maximum sediment concentrations from the Mattawoman Creek sediment samples are compared to sediment screening values in Table 7-19. Based on this comparison, 12 inorganic chemicals were identified as COPCs in Mattawoman Creek sediment (Table 7-19). Of these, six had HQs equaling or exceeding one based on detected maximum concentrations; five were retained as COPCs because they were detected but screening values were not available (Table 7-19). Cadmium was not detected in any of the Mattawoman Creek sediment samples; however, it was retained as a COPC because it had a reporting limit-based HQ greater than 1.

Twenty-five SVOCs were identified as COPCs. Of these, 23 were not detected, with maximum reporting limits that exceeded screening values. One SVOC, n-nitrosodiphenylamine, had a HQ exceeding one based on the detected maximum concentration and one (i.e., benzaldehyde) had no available screening value.

No explosives were detected in the Mattawoman Creek sediment samples.

7.6.1.2 Foodweb Exposure Screening

Onsite. The maximum exposure doses of bioaccumulative chemicals (USEPA, 2000) for each upper trophic-level receptor species are compared to ingestion screening values in Table 7-20. The estimated dose of the following chemicals resulted in NOAEL-based HQs exceeding one for the receptors listed:

- Arsenic—shrew, vole, mink, fox, muskrat, robin, dove, owl, heron, mallard, swallow (all receptors)
- Cadmium—shrew, vole, mink, fox, muskrat, robin, dove, owl, mallard, swallow
- Chromium—shrew, vole, fox, robin, dove, owl, mallard, swallow
- Copper—shrew, vole, fox, robin, dove, owl, swallow
- Lead—shrew, vole, fox, muskrat, robin, dove, owl, heron, mallard, swallow
- Mercury—shrew, vole, fox, muskrat, robin, dove, owl, heron, mallard, swallow
- Selenium—shrew, vole, mink, fox, muskrat, robin, dove, owl, mallard, swallow
- Silver—shrew, robin, owl, swallow
- Zinc—all receptors
- Hexachlorobenzene—heron

Based on these risk calculations, arsenic, cadmium, chromium, copper, lead, mercury, selenium, silver, zinc, and hexachlorobenzene are COPCs for higher trophic-level receptors utilizing Site 28 (Table 7-20).

Mattawoman Creek. The maximum exposure doses of bioaccumulative chemicals (USEPA, 2000) for each upper trophic-level receptor species are compared to ingestion screening

values in Table 7-21. The estimated dose of the following inorganics resulted in NOAEL-based HQs exceeding one for the receptors listed:

- Arsenic—muskrat
- Lead—mallard
- Mercury—muskrat, heron, mallard
- Selenium—muskrat
- Zinc—mallard
- Hexachlorobenzene—heron

Based on these risk calculations, arsenic, lead, mercury, selenium, zinc, and hexachlorobenzene are COPCs for higher trophic-level receptors utilizing Mattawoman Creek adjacent to Site 28 (Table 7-21).

Ingestion screening values were not available for two SVOCs (4-bromophenyl-phenylether and 4-chlorophenyl-phenylether), that therefore could not be evaluated for potential foodweb exposure to ecological receptors. Because each of these chemicals was detected in 1 of 35 surface soil samples, they were also retained as COPCs.

7.6.1.3 Summary of COPCs

COPCs were identified for each of the exposure routes evaluated (i.e., direct exposure for lower trophic-level receptors and foodweb exposure for higher trophic-level receptors). These COPCs include detected chemicals with an HQ in excess of one (direct exposure or food web), nondetected chemicals with an HQ in excess of one (direct exposure or food web); and detected chemicals that could not be evaluated due to lack of a soil screening value or lack of an appropriate NOAEL. All of the COPCs are summarized in Table 7-22.

7.7 Risk Characterization

Based on a set of conservative assumptions in Steps 1 and 2 of the risk assessment process (subsections 7.3 and 7.4), multiple chemicals were identified as COPCs in the SERA (Table 7-22). Based on these COPCs, risks to receptors are summarized below:

- Terrestrial
  - Soil invertebrates and plants. HQs > 1 were calculated for inorganics, SVOCs, explosives, and VOCs
  - Avian terrestrial herbivores. HQs > 1 were calculated for inorganics
  - Avian terrestrial insectivores. HQs > 1 were calculated for inorganics
  - Avian terrestrial carnivores. HQs > 1 were calculated for inorganics
  - Mammalian terrestrial herbivores. HQs > 1 were calculated for inorganics
  - Mammalian terrestrial insectivores. HQs > 1 were calculated for inorganics
  - Mammalian terrestrial carnivores. HQs > 1 were calculated for inorganics
- Wetland and Aquatic
  - Benthic invertebrates and plants. HQs > 1 were calculated for inorganics
  - Water column receptors. HQs > 1 were calculated for inorganics

- Avian wetland/aquatic omnivores. HQs > 1 were calculated for inorganics
- Avian wetland/aquatic insectivores. HQs > 1 were calculated for inorganics
- Avian wetland/aquatic piscivores. HQs > 1 were calculated for inorganics and hexachlorobenzene
- Mammalian wetland/aquatic herbivores. HQs > 1 were calculated for inorganics
- Mammalian wetland/aquatic carnivores. HQs > 1 were calculated for inorganics

7.8 Step 3A—Refinement of Conservative Exposure Assumptions

According to Superfund guidance (USEPA, 1997), Step 3 initiates the problem formulation phase of the BERA. Under Navy guidance (Chief of Naval Operations, 1999), the BERA is defined as Tier 2, and the first activity under Tier 2 is Step 3A. In Step 3A, the conservative assumptions employed in Tier 1 are refined and risk estimates are re-calculated using the same conceptual site model for the site. The refined risk calculations are described in the following subsections. This step is conducted to assist with the identification of risk drivers (i.e., chemicals that may pose the greatest risk). In some cases, additional information is presented that has bearing on whether a chemical is identified as a potential risk driver.

If re-evaluation of the conservative exposure assumptions supports an acceptable risk finding, then the site may exit the ERA process (Chief of Naval Operations, 1999). However, if it is determined that unacceptable risk exists, then the site moves forward in the process and Step 3B is conducted, where the BERA problem formulation is completed based on the conclusions from Step 3A.

7.8.1 Assumptions and Approach

Assumptions and methods modified for the refined risk calculations for both direct exposure and foodweb HQs are listed as follows (along with justification for each modification):

Average chemical concentrations were used instead of the maximum concentrations as the exposure point concentration for direct exposure (lower trophic-level receptors) and for estimating dietary doses (foodweb modeling). Since upper trophic-level receptors are expected to forage in several different areas across the site, average chemical concentrations provide a more realistic estimate of the likely level of chemical exposure such receptors would encounter. The 35 surface soil sample locations covering the site and the sediment sample locations downgradient are expected to adequately represent the level of chemical contamination in this relatively small area (approximately 2 acres). For non-detected chemicals, the mean of the detection limits was used.

Average chemical concentrations were calculated using the arithmetic mean for each chemical/medium group. Although the data were not statistically evaluated for normality prior to calculation of the arithmetic mean, COCs were identified in all media evaluated and carried forward in the risk assessment process. Therefore, it is unlikely that using an arithmetic mean resulted in excluding chemicals that warrant further evaluation because many of the samples contained elevated concentrations of the COCs identified.

Midpoints of the receptor body weight and food ingestion rate presented in Table 7-23 were used to develop exposure estimates for higher trophic-level receptors, rather than minimum body weights and maximum ingestion rates. Because they represent the characteristics of a greater proportion of the individuals in a population, midpoint exposure parameters is often more realistic. The same refinement step was undertaken for soil-to-plant and soil-to-invertebrate BCFs/BAFs. For the revised risk calculations, central tendency estimates were used (Tables 7-24 through 7-27) rather than maximums.

7.8.2 Refined Risk Calculations

7.8.2.1 Detected COCs—Direct Exposure

The refined risk calculations (i.e., HQs) for detected direct exposure COCs are presented in Tables 7-28 through 7-31.

Surface Soil. Thirteen inorganics exceeded screening values based on detected mean concentrations (i.e., aluminum, antimony, beryllium, cadmium, chromium, copper, iron, lead, mercury, nickel, silver, vanadium and zinc) and are therefore potential risk-driving COCs at Site 28. The mean-based HQs for these inorganics ranged from 3.59 (antimony) to 79,388 (lead).

Twenty-three SVOCs exceeded screening values based on detected mean concentrations. Six phenolics (i.e., 2,4,5-trichlorophenol, 2,4,6-trichlorophenol, 2,4-dichlorophenol, 2-chlorophenol, pentachlorophenol, and phenol) were each detected in only 1 of 35 samples (i.e., IS28SS36). Of these six phenolics, three had HQs of 1.00 and two had HQs of 1.30. As discussed in Appendix C, Section J.1.4, these detections are likely the result of erroneous laboratory results. After discussion with the data validator, the validator agreed that the samples should be rejected (Appendix C, Attachment B). The low frequency of detections and likelihood that they are laboratory artifacts suggest that these SVOCs are not risk-driving COCs at Site 28.

Sixteen individual PAH compounds exceeded screening values based on mean concentrations, with all HQs being less than 3.0. PAHs were detected scattered across the site, but at generally low concentrations. The Region III screening value for individual PAHs compounds appears to be based on background value, rather than on an ecological effects value. A published earthworm toxicity value of 173,000 µg/kg (LC_{50}) is available for fluorene (Neuhauser et al., 1985a, 1985b). A commonly applied safety factor for LC_{50} values is 100. Therefore, by applying this safety factor an effects value of 1,730 µg/kg can be obtained for fluorene. All individual PAH concentrations in the surface soil samples were below this value. The maximum individual PAH concentration measured was for benzo(b)fluoranthene at 1,700 µg/kg and the mean concentrations of all the individual PAH compounds were less than 300 µg/kg. Additionally, recent toxicological studies by Environment Canada showed that earthworm (*E. foetida*) survival was not affected by test concentrations of benzo(a)pyrene as high as 48,000 mg/kg (Canadian Council of Ministers of the Environment, 1999). Therefore, PAHs are likely not risk-driving COCs for surface soil at Site 28.

No other chemicals detected in surface soil had HQs equal to or greater than one.

On-Site Sediment. Six inorganics exceeded screening values based on detected mean concentrations (i.e., arsenic, cadmium, chromium, copper, lead, and zinc). The HQs for these metals ranged from 1.64 (copper) to 38.4 (zinc); these metals are considered potential risk-driving COCs at Site 28.

N-nitrosodiphenylamine was detected in only one of the six swale sediment samples at a concentration of 220 µg/kg. The sediment screening value of 28 µg/kg for this chemical is based on an Apparent Effect Threshold (AET) for marine sediments. Therefore, there is uncertainty in the conclusion of the potential risk posed by this chemical, since the sediments at Site 28 are freshwater and there is inherent uncertainty in AET values. AET values are derived by identifying the sample from a whole sediment toxicity data set that has the highest level of n-nitrosodiphenylamine and a measured ecological effect. Effects could be apparent in samples with n-nitrosodiphenylamine at higher concentrations, but be due to other compounds. Thus, the AET has a high degree of uncertainty and combined contaminant effects cannot be separated from single contaminant effects. No other effects levels have been published for this chemical. However, given the low frequency of detection, the relatively low concentration detected in the one sample, and the uncertainty associated with the screening value, this chemical is likely not a risk-driving COC for onsite sediment at Site 28.

No other chemicals detected in onsite sediment had HQs equal to or greater than one.

Surface Water. While five inorganics had mean-based HQs exceeding one for total metals (i.e., cadmium, copper, iron, lead, and zinc), only two inorganics had HQs exceeding one for dissolved metals (i.e., cadmium and zinc). All of these metals are potential risk-driving COCs at Site 28.

No other chemicals carried into Step 3 were detected in surface water.

Mattawoman Creek Sediment. Two inorganics had mean-based HQs exceeding one (i.e., chromium and silver) and are therefore potential risk-driving COCs at Site 28. The other four inorganics identified as COPCs in Step 2 (arsenic, mercury, nickel, and zinc) had mean HQs less than one and were only detected in 1 of 10 samples. Therefore, they were not considered potential risk-driving COCs.

N-nitrosodiphenylamine was detected in one sediment sample at a concentration of 79 µg/kg. Given the uncertainty in the screening value (described above) and the relatively low concentration detected, this chemical is likely not a risk-driving COC for the sediments in Mattawoman Creek adjacent to Site 28.

No other chemicals detected in Mattawoman Creek sediment had HQs equal to or greater than one.

7.8.2.2 Detected COCs— Foodweb Exposure

The refined HQ calculations for foodweb exposure COCs are presented in Tables 7-32 (onsite) and 7-33 (Mattawoman Creek).

Onsite. The estimated dose of the following inorganics resulted in NOAEL-based HQs exceeding one for the receptors listed:

- Arsenic—shrew, vole, muskrat
- Cadmium—shrew, vole, fox, robin, dove, owl, swallow
- Lead—shrew, robin, dove, owl, heron, mallard, swallow
- Mercury—shrew, heron
- Selenium—shrew, vole
- Zinc—all receptors

Based on these refined risk calculations, arsenic, cadmium, lead, mercury, selenium, and zinc are potential risk-driving COCs for higher trophic-level receptors utilizing Site 28 (Table 7-32).

Mattawoman Creek. The estimated dose of mercury resulted in a NOAEL-based HQ exceeding one for the heron. The estimated dose of mercury resulted in LOAEL-based HQ less than one for the heron (Table 7-33). Based on these refined risk calculations, mercury is a potential risk-driving COC for higher trophic-level receptors that utilize Mattawoman Creek.

7.8.2.3 Nondetected COCs: Direct Exposure

Surface Soil. There were three nondetected direct-exposure COCs in surface soil (i.e., thallium, 2,4-dinitophenol, and 4-nitrophenol) that had mean-based HQs in excess of 1 based on reporting limit exceedences of screening values. While there is some associated uncertainty, the fact that they were not detected in any of the 35 surface soil samples suggests they are not present in substantial quantities and therefore are unlikely to be risk-drivers.

Onsite Sediment. There were 15 nondetected direct-exposure COCs in the onsite sediment that had mean-based HQs exceeding 1 based on reporting limit exceedences of screening values. These compounds included 14 SVOCs and one VOC. The reporting limit range for the SVOCs was broad, which caused the mean concentrations for these compounds to be artificially high. Because these compounds were not detected onsite, and semivolatile and volatile organic compounds were not specifically known to have been used or released at the site, it is unlikely that they are risk-driving COCs at Site 28.

Surface Water. Several nondetected inorganic COCs in the swale surface water had mean-based HQs exceeding 1 based on reporting limit exceedences of screening values. These inorganics included aluminum (total metals), lead (dissolved metals), and silver (total and dissolved). These metals have been retained as potential risk-drivers at Site 28.

Ten nondetected SVOCs and one VOC also had mean-based HQs exceeding 1 for direct surface water exposure. As discussed for sediment above, because these SVOCs were not detected onsite and SVOCs in general were not specifically known to have been used or released at the site, it is unlikely that they are risk-driving COCs at Site 28.

Mattawoman Creek Sediment. Seventeen nondetected SVOCs had mean-based HQs that were greater than one based on reporting limit exceedences of screening values. For the reasons discussed above, SVOCs are not considered COCs at Site 28.

7.8.2.4 Detected COCs without Screening Values: Direct Exposure

Surface Soil. Thirty-six detected COCs for surface soil were identified because they were detected and had no available screening values (Table 7-28). Twenty-six are SVOCs. Each of these SVOCs was detected in 7 or fewer of the 35 surface soil samples, and 21 of the 26 were detected in only 1 of 35 surface soil samples, at sample location IS28SS36. As discussed in Appendix C, Section J.1.4, these detections are likely the result of erroneous laboratory results. After discussion with the data validator, the validator agreed that the samples should be rejected (see Appendix C, Attachment B). The remaining SVOCs were either detected infrequently (i.e., 5 or fewer of 35 samples) or are common laboratory contaminants or both (i.e., bis(2-ethylhexyl)phthalate), and therefore were not considered risk-driving COCs.

Five of the detected chemicals without screening values are explosives. All of these compounds were detected in 4 or fewer of the 35 surface soil samples, and are therefore not considered risk-driving COCs.

Five of the detected COCs without screening values are VOCs. Of these, 2 were detected in 1 of 35 soil samples, while 1 (m and p-xylene) was detected in only 1 of 15 samples. These low frequencies of detection suggest that these VOCs are not risk-driving COCs at Site 28.

MTBE was detected in a total of 19 of 35 soil samples, and 1,2-dichloroethene (total) was detected in 8 of 15 soil samples. These compounds were detected at relatively low concentrations and were therefore not considered risk-driving COCs at Site 28.

Onsite Sediment. Fourteen detected COCs without screening values were found in the onsite sediment samples (Table 7-29). Five of these were inorganics (i.e., barium, beryllium, cobalt, selenium, and vanadium), which were retained as potential risk-driving COCs. One SVOC (i.e., 2,4-dinitrotoluene), four explosives (i.e., 2,4-dinitrotoluene, 2-amino-4,6-dinitrotoluene, 4-amino-2,6-dinitrotoluene, and nitroglycerin), and four VOCs (i.e., 1,2-dichloroethene (total), acetone, MTBE, and cis-1,2-dichlorobenzene) were also detected and have no available screening value.

In general, explosive compounds have one or more nitro groups on the parent molecule. Nitro compounds are reduced to amino compounds and bind to organic matter when released to soil and sediment (Roberts and Hartley, 1992). No information regarding the specific ecotoxicity 2,4-dinitrotoluene, 2-amino-4,6-dinitrotoluene, 4-amino-2,6-dinitrotoluene, and nitroglycerin was found. However, in general, the fate and transport information for nitro compounds suggest that these compounds have limited persistence in aquatic environments. Explosives were not detected in any of the Mattawoman Creek sediment samples analyzed for explosives and were detected in only one of the swale sediment samples. Therefore, explosives are not considered risk-driving COCs at Site 28.

Surface Water. There were no potential surface water COCs for which screening values were not available.

Mattawoman Creek Sediment. Six Mattawoman Creek sediment COCs had no screening values available (Table 7-31). Of these, five are inorganics (i.e., same as above for onsite sediment) and one (i.e., benzaldehyde) is an SVOC. The inorganics were considered potential risk-driving chemicals in the Mattawoman Creek sediments, but benzaldehyde,

because it was not found in any onsite sediment samples and only one surface soil sample (SS36), it is not considered a risk-driving COC.

7.8.2.5 Detected COCs without Screening Values: Foodweb Exposure

Ingestion screening values were not available for two SVOCs (4-bromophenyl-phenylether and 4-chlorophenyl-phenylether), that therefore could not be evaluated for potential foodweb exposure to ecological receptors. However, because they were detected in only 1 of 35 soil samples (SS36) and no other SVOCs were found to be risk-driving COCs, these compounds are not considered risk-driving COCs for foodweb exposures.

7.9 Comparison to Background and Other Data

7.9.1 Surface Soil

Concentrations of the thirteen inorganic COCs that were measured above soil screening values were compared to the same inorganics detected in NDWIH background samples collected for the Background Soil Investigation Report for Indian Head and Stump Neck Annex (Tetra Tech NUS, 2002a). The table below compares the concentrations of the metals for which background concentrations for IHDIV (Tetra Tech NUS, 2002a) were available. No background data were available for antimony.

Chemical	Average Site Concentration (mg/kg)	Average Background Concentration (mg/kg)	Ratio (Site/Background)
Aluminum	5809	7,540	0.77
Beryllium	0.22	0.44	0.5
Cadmium	15.7	0.4	39.25
Chromium	19.3	13.6	1.42
Copper	119	6.7	17.76
Iron	19,163	13,000	1.47
Lead	794	18.7	42.46
Mercury	0.55	0.06	9.17
Nickel	10.6	5.4	1.96
Silver	1.72	0.6	2.87
Vanadium	23.5	23.3	1.01
Zinc	9,594	20.2	474.95

The average site concentrations of aluminum and beryllium were less than the average background concentrations for these metals. The site/background ratios of chromium, iron, and vanadium were all less than 1.5. This suggests that, since these COCs were not substantially higher than background soil concentrations, it is unlikely that their concentrations are site-related. As such, aluminum, beryllium, chromium, iron, and vanadium are not considered risk-drivers. Cadmium, copper, lead, mercury, nickel, silver, and zinc, as well as antimony, were retained as potential risk-driving COCs in surface soil.

7.9.2 Onsite Sediment

Concentrations of the eleven inorganic COCs in onsite sediment were compared to the same inorganics detected in NDWIH background sediment samples collected from freshwater streams believed not to have been impacted by facility operations (i.e., four locations on Stump Neck Annex, three on NDWIH, two from a nearby State Park and one from a nearby State Forest) (Tetra Tech NUS, 2002b).

Chemical	Average Site Concentration (mg/kg)	Average Background Concentration (mg/kg)	Ratio (Site/Background)
Arsenic	49.2	3.3	14.91
Barium	53.7	42.0	**1.28**
Beryllium	0.19	0.52	**0.37**
Cadmium	9.44	0.35	26.97
Chromium	10.7	11.6	**0.92**
Cobalt	5.13	5.97	**0.86**
Copper	55.8	9.5	5.87
Lead	372	23.1	16.10
Selenium	0.72	0.93	**0.77**
Vanadium	13.7	18.6	**0.74**
Zinc	5,762	41.2	139.85

The average site concentrations of beryllium, chromium, cobalt, selenium, and vanadium were less than the average background concentrations for these metals. The site/background ratio of barium was 1.28. This suggests that, since these COCs were lower than or similar to background sediment concentrations, it is unlikely that their concentrations are site-related. As such, barium, beryllium, chromium, cobalt, selenium, and vanadium are not considered risk-drivers. Arsenic, cadmium, copper, lead, and zinc were retained as potential risk-driving COCs in onsite sediment.

7.9.3 Spatial Distribution of COCs in Surface Soil and Onsite Sediments

COCs were measured in samples collected in all areas of Site 28. The maximum concentration of each inorganic COC in soil was measured in samples collected in the center of Zone A (the probable location of the zinc recovery furnace and shoreline burning cage). Of the 8 soil COCs, 5 (i.e., antimony, cadmium, copper, lead, and nickel) had maximum concentrations detected in sample IS28SS19 (Figure 4-2 and Table 4-1). The maximum mercury concentration was measured in IS28SS15, the maximum silver concentration in IS28SS10, and the maximum zinc concentration in IS28SS08. High concentrations of all of the COCs were measured in samples collected adjacent to both sets of swales (i.e., Swales 1–3, and Swale 4).

The maximum concentration of each inorganic COC in sediment was measured in sample IS28SD02-0503. This sample location was in the upstream end of Swale 4. The maximum detected concentrations of cadmium and zinc were also measured at this location (SW02-0503).

The second highest concentration measured for each sediment COC was either IS28SD03-0503 (for arsenic and cadmium) or SD05 (for copper, lead, and zinc). Relatively low COC concentrations were detected in SD01-0503 just downgradient in Swale 4.

Although COCs were present in Swale 4, the high concentrations detected in swales 1-3, and at IS28SD05 (at the mouth of the swale) suggest that there is potentially more migration of COCs offsite via this swale than there is via Swale 4. For most COCs in sediment, concentrations at IS28SD01 and IS28SD02 are much lower than in IS28SD05, IS28SD04, and IS28SD03, (in the case of zinc, exponentially lower), suggesting that COC contamination is most notable adjacent to Zone A where the swales discharge to Mattawoman Creek.

COCs were detected in soil in Zone B, outside of the fenceline, but at relatively low concentrations. This suggests that the movement of COCs offsite to adjacent terrestrial environments is relatively negligible.

7.9.4 Mattawoman Creek Sediment

7.9.4.1 Surface Sediments

Evaluation of the spatial distribution of inorganic COCs in the sediments of Mattawoman Creek adjacent to Site 28 revealed that at three sampling locations six metals (arsenic, cadmium, chromium, copper, lead, and zinc) exceeded screening values at both depth intervals sampled (0–6 and 6–12 in.). The three locations were IS28SD03, IS28SD04, and IS28SD05, which are located immediately along the Site 28 boundary with Mattawoman Creek in the vicinity of where the swales discharge to the creek (Figure 4-5). Chromium was the only metal that exceeded its screening value at the majority of the sampling locations, with a frequency of exceedence of 27 out of 29 samples. However, the chromium concentrations in the Site 28 shoreline samples (IS28SD01 through IS28SD05) and the channel samples (IS28SD06 through IS28SD10) were all below the reported Mattawoman Creek background concentrations for chromium of 21.3 mg/kg (Area 6 of the Mattawoman Creek Study; Tetra Tech NUS, 2002b) and 44 mg/kg (mean concentration of six samples collected at the mouth of Mattawoman Creek; Tetra Tech NUS, 2002b). In contrast, the samples collected along the depositional bar across from Site 28 (Figure 4-5) contained chromium concentrations ranging from 19.2 to 27.8 mg/kg, which are slightly above the background concentration of 21.3 mg/kg reported in the Mattawoman Creek Study, but below the background concentration of 44 mg/kg reported in the Background Study (Tetra Tech NUS, 2002b) and the NOAA freshwater sediment screening value for chromium of 37.3 mg/kg (Buchmann, 1999). The chromium concentrations in the samples collected along the Site 28 shoreline (IS28SD01 through IS28SD05) ranged from 3.4 to 16.7 mg/kg. Therefore, the data suggest that Site 28 is likely not the source of chromium measured in the sediment along the depositional bar.

Other than at sampling locations IS28SD03 through IS28SD05, only one other location contained a zinc concentration above the screening value (IS28SD11). The zinc concentration in the surface sample from this location was 159 mg/kg, which is slightly higher than the screening value of 150 mg/kg. However, this value falls within the range of reported background concentrations of 108 and 186 mg/kg reported for upstream of the site and at the mouth of Mattawoman Creek, respectively. The 6-to-12-in. sample at this location contained 116 mg/kg of zinc.

Thus, the data show that a potential risk exists to benthic invertebrates and aquatic plants from arsenic, cadmium, chromium, copper, lead, and zinc in the sediments immediately along the Site 28 shoreline. The data also show that risk from chromium is likely not site-related, but rather consistent with ambient conditions because the concentrations found were less than background levels. The potential risk from these metals appears to be limited spatially to the shoreline area where samples IS28SD03 through IS28SD05 were collected. No exceedences of the screening values were found at location IS28SD01 and only two exceedences (arsenic and chromium) were found at location IS28SD02, but the concentrations were consistent with background levels. The only metal to exceed screening in the channel samples (IS28SD06 through IS28SD10) and the samples collected along the depositional bar across from the site (IS28SD11 through IS28SD15) was chromium, with one exception as noted above for zinc (IS28SD11). However, the concentrations of chromium in these samples were all consistent with background levels for this metal.

A potential risk from COCs in the on-site sediments (swales and immediate shoreline) was identified for all the upper trophic level assessment endpoints evaluated in the ERA (Table 7-32); with zinc being the primary risk driver. Although upper trophic level receptors are likely to forage over a larger area than that represented by the on-site sediments alone; this limited exposure evaluation was used to conservatively estimate potential risk from on-site sediments. A similar analysis was performed to evaluate upper trophic level receptor exposure to sediments in Mattawoman Creek adjacent to the site, but excluding the immediate shoreline area (i.e., the channel and depositional bar samples, IS28SD06 through IS28SD15). This evaluation revealed a potential risk for only one of the receptor species (great blue heron). A potential risk to piscivorous birds (represented by great blue heron) was identified for mercury (NOAEL-based HQ of 2.42). However, it is likely that the potential risk is not related to Site 28 because mercury was detected in only 2 of the 15 surface sediment samples (IS28SD04 and IS28SD11). The concentrations detected at these locations were 0.37 and 0.44 mg/kg, respectively. These concentrations fall within the range of background mercury levels (0.17 to 0.74 mg/kg) reported for Mattawoman Creek (Tetra Tech NUS, 2002a). Thus, the data suggest that the potential risk to upper trophic level receptors from site-related sediment COPCs is limited to the sediments in the swales at the site and along the immediate shoreline of the site.

7.9.4.2 Subsurface Sediments

The same pattern of COPC distribution found in the surface sediment samples was found in the subsurface samples. The samples collected at a depth of 6–12 in. below the sediment/water interface from locations IS28SD03 through IS28SD05 contained concentrations of arsenic, cadmium, chromium, copper, lead, and zinc above the screening values. Similar to the surface samples, chromium was detected above the screening value in the majority of the subsurface samples, but at concentrations consistent with background levels. There were no other metals detected above screening values in any of the other subsurface samples. Thus, similar to the surface sediments, the area of elevated COPC concentrations in the subsurface appears to be limited to the immediate shoreline area at Site 28.

These findings confirm the conclusion of previous studies that metals are the most significant contaminants in the study area and that elevated "hot spots" of metals contamination may be notable in sediments. The 0-to-6-in. sediment sample collected at

IS28SD05 contained the maximum concentration of lead and zinc, as well as arsenic and copper. This suggests that runoff carried by the swales at the site may have transported metals offsite into Mattawoman Creek, where were deposited in the shoreline area resulting in a potential "hot spot."

7.10 Risk Conclusion

The conclusions are stated in the executive summary at the beginning of this section.

7.11 Uncertainty

The development of these measures of risk is based on a variety of assumptions regarding levels of exposure and toxicity. However, the screening-level assessment is designed to counter some of the associated uncertainty through the use of very conservative assumptions. Sources of exposure uncertainty include the representativeness of the analytical data collected for the assessment, the use of literature values to develop exposure estimates rather than site-specific information, and the assumption that all areas of the site are equally used by receptors.

Another source of exposure uncertainty is the use of literature values or default assumptions for exposure parameters rather than site-specific information. BAFs provide an example. Although BAFs for bioaccumulative metals were readily available and incorporated into the assessment, the use of a default BAF of 1 to estimate the concentration of other chemicals in receptor prey items is a source of uncertainty. However, for most of the chemicals analyzed at the site, the assumption that the chemical body burden in the prey item is the same as the concentration in soil or sediment is conservative, particularly when many of the chemicals are known not to accumulate to any significant degree.

There is also uncertainty regarding the effects of site chemicals on receptor communities and species. Reference toxicity values for receptor species and communities were based on literature values for, in most cases, other species. The sensitivity of receptors at the site may be different than the sensitivity of species used in tests reported in the literature. In the absence of speciation analyses, assumptions must also be made about the equality of chemical form between laboratory tests and site conditions. This is a source of uncertainty since toxicity may vary with the form of the toxicant in the environment.

Another source of uncertainty is the extrapolation of NOAELs to LOAELs using an uncertainty factor of ten. However, this approach is likely conservative. Dourson and Stara (1983, cited in USEPA, 1997) determined that 96 percent of the chemicals included in a data review had LOAEL/NOAEL ratios of five or less. The use of an uncertainty factor of 10, although potentially conservative, also serves to counter some of the uncertainty associated with interspecies extrapolations, for which a specific uncertainty factor was not used.

7.12 References

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Table 7-4
Surface Soil Summary Statistics
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Inorganics (MG/KG)						
Aluminum	28.0 - 98.0	35 / 35	13,100	IS28SS22-0001	5,809	2,498
Antimony	8.40 - 29.0	6 / 19	18.3	IS28SS19-0001	1.72	4.14
Arsenic	1.40 - 4.90	35 / 35	377	IS28SS04-0001	77.9	93.7
Barium	28.0 - 98.0	35 / 35	1,550	IS28SS19-0001	153	300
Beryllium	0.70 - 2.40	3 / 35	2.00	IS28SS22-0001	0.22	0.34
Cadmium	0.70 - 2.40	25 / 35	141	IS28SS19-0001	15.7	28.7
Calcium	700 - 2,400	35 / 35	23,500	IS28SS10-0001	2,773	5,533
Chromium	1.40 - 4.90	35 / 35	169	IS28SS19-0001	19.3	30.4
Cobalt	7.00 - 24.0	35 / 35	13.2	IS28SS41-0001	4.76	2.67
Copper	3.50 - 12.0	35 / 35	1,270	IS28SS19-0001	119	258
Iron	14.0 - 49.0	35 / 35	84,600	IS28SS10-0001	19,163	16,488
Lead	0.43 - 31.0	35 / 35	10,300	IS28SS19-0001	794	1,915
Magnesium	700 - 2,400	35 / 35	2,580	IS28SS19-0001	764	561
Manganese	2.10 - 7.30	35 / 35	711	IS28SS10-0001	205	177
Mercury	0.077 - 0.42	16 / 35	11.5	IS28SS15-0001	0.55	1.93
Nickel	5.60 - 20.0	26 / 35	44.1	IS28SS19-0001	10.6	10.3
Potassium	700 - 2,400	30 / 35	1,310	IS28SS22-0001	452	255
Selenium	0.70 - 2.40	10 / 35	1.30	IS28SS10-0001	0.43	0.31
Silver	1.40 - 4.90	10 / 35	16.1	IS28SS10-0001	1.72	3.16
Sodium	700 - 2,400	3 / 35	123	IS28SS40-0001	28.5	28.5
Thallium	1.40 - 4.90	0 / 35	--	--	0.40	0.14
Vanadium	7.00 - 24.0	35 / 35	70.4	IS28SS10-0001	23.5	14.3
Zinc	2.90 - 390	35 / 35	71,900	IS28SS08-0001	9,594	17,784
Semivolatile Organic Compounds (UG/KG)						
1,1-Biphenyl	370 - 2,400	1 / 35	120	IS28SS36-0001	283	218
2,4,5-Trichlorophenol	930 - 6,000	1 / 35	130	IS28SS36-0001	706	546
2,4,6-Trichlorophenol	370 - 2,400	1 / 35	100	IS28SS36-0001	283	219
2,4-Dichlorophenol	370 - 2,400	1 / 35	100	IS28SS36-0001	283	219

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 7-4
Surface Soil Summary Statistics
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
2,4-Dimethylphenol	370 - 2,400	1 / 35	77.0	IS28SS36-0001	282	219
2,4-Dinitrophenol	930 - 6,000	0 / 35	--	--	715	539
2,4-Dinitrotoluene	370 - 2,400	3 / 35	1,200	IS28SS10-0001	309	268
2,6-Dinitrotoluene	370 - 2,400	1 / 35	110	IS28SS36-0001	283	218
2-Chloronaphthalene	370 - 2,400	1 / 35	110	IS28SS36-0001	283	218
2-Chlorophenol	370 - 2,400	1 / 35	100	IS28SS36-0001	283	219
2-Methylnaphthalene	370 - 2,400	1 / 35	150	IS28SS36-0001	284	217
2-Methylphenol	370 - 2,400	1 / 35	86.0	IS28SS36-0001	282	219
2-Nitroaniline	930 - 6,000	1 / 35	64.0	IS28SS36-0001	704	548
2-Nitrophenol	370 - 2,400	1 / 35	100	IS28SS36-0001	283	219
3,3'-Dichlorobenzidine	370 - 2,400	0 / 35	--	--	285	217
3-Nitroaniline	930 - 6,000	0 / 35	--	--	715	539
4,6-Dinitro-2-methylphenol	930 - 6,000	1 / 35	98.0	IS28SS36-0001	705	547
4-Bromophenyl-phenylether	370 - 2,400	1 / 35	120	IS28SS36-0001	283	218
4-Chloro-3-methylphenol	370 - 2,400	1 / 35	82.0	IS28SS36-0001	282	219
4-Chloroaniline	370 - 2,400	0 / 35	--	--	285	217
4-Chlorophenyl-phenylether	370 - 2,400	1 / 35	120	IS28SS36-0001	283	218
4-Methylphenol	370 - 2,400	1 / 35	80.0	IS28SS36-0001	282	219
4-Nitroaniline	930 - 6,000	0 / 35	--	--	715	539
4-Nitrophenol	930 - 6,000	0 / 35	--	--	715	539
Acenaphthene	370 - 2,400	2 / 35	130	IS28SS36-0001	279	222
Acenaphthylene	370 - 2,400	4 / 35	120	IS28SS36-0001	268	230
Acetophenone	370 - 2,400	1 / 35	100	IS28SS36-0001	283	219
Anthracene	370 - 2,400	4 / 35	120	IS28SS36-0001	266	229
Atrazine	370 - 2,400	1 / 35	100	IS28SS36-0001	283	219
Benzaldehyde	370 - 2,400	1 / 35	150	IS28SS36-0001	284	217
Benzo(a)anthracene	370 - 2,400	20 / 35	540	IS28SS15-0001	188	204
Benzo(a)pyrene	370 - 2,400	18 / 35	810	IS28SS15-0001	207	218
Benzo(b)fluoranthene	370 - 2,400	23 / 35	1,700	IS28SS15-0001	235	323

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 7-4
Surface Soil Summary Statistics
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Benzo(g,h,i)perylene	370 - 2,400	9 / 35	540	IS28SS42-0001	238	195
Benzo(k)fluoranthene	370 - 2,400	16 / 35	660	IS28SS15-0001	205	211
Bis(2-chloro-1-methylethyl) ether	370 - 2,400	1 / 35	100	IS28SS36-0001	283	219
Butylbenzylphthalate	370 - 2,400	5 / 35	340	IS28SS06-0001	277	225
Caprolactam	370 - 2,400	1 / 35	86.0	IS28SS36-0001	282	219
Carbazole	370 - 2,400	3 / 35	140	IS28SS36-0001	274	225
Chrysene	370 - 2,400	22 / 35	620	IS28SS15-0001	193	211
Di-n-butylphthalate	370 - 2,400	7 / 35	550	IS28SS20-0001	206	203
Di-n-octylphthalate	370 - 2,400	1 / 35	120	IS28SS36-0001	283	218
Dibenz(a,h)anthracene	370 - 2,400	8 / 35	500	IS28SS42-0001	242	195
Dibenzofuran	370 - 2,400	2 / 35	120	IS28SS36-0001	279	221
Diethylphthalate	370 - 2,400	6 / 35	160	IS28SS19-0001	236	165
Dimethyl phthalate	370 - 2,400	1 / 35	110	IS28SS36-0001	283	218
Fluoranthene	370 - 2,400	26 / 35	850	IS28SS17-0001	196	231
Fluorene	370 - 2,400	1 / 35	120	IS28SS36-0001	283	218
Hexachlorobenzene	370 - 2,400	1 / 35	130	IS28SS36-0001	284	218
Hexachlorobutadiene	370 - 2,400	1 / 35	120	IS28SS36-0001	283	218
Hexachlorocyclopentadiene	370 - 2,400	1 / 35	79.0	IS28SS36-0001	282	219
Hexachloroethane	370 - 2,400	1 / 35	95.0	IS28SS36-0001	283	219
Indeno(1,2,3-cd)pyrene	370 - 2,400	17 / 35	1,100	IS28SS15-0001	227	253
Isophorone	370 - 2,400	1 / 35	110	IS28SS36-0001	283	218
Naphthalene	370 - 2,400	1 / 35	110	IS28SS36-0001	283	218
Nitrobenzene	370 - 2,400	1 / 35	120	IS28SS36-0001	283	218
Pentachlorophenol	930 - 6,000	1 / 35	130	IS28SS36-0001	706	546
Phenanthrene	370 - 2,400	16 / 35	740	IS28SS17-0001	193	219
Phenol	370 - 2,400	1 / 35	100	IS28SS36-0001	283	219
Pyrene	370 - 2,400	26 / 35	550	IS28SS17-0001	185	212
bis(2-Chloroethoxy)methane	370 - 2,400	1 / 35	110	IS28SS36-0001	283	218
bis(2-Chloroethyl)ether	370 - 2,400	1 / 35	110	IS28SS36-0001	283	218

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 7-4
Surface Soil Summary Statistics
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
bis(2-Ethylhexyl)phthalate	370 - 2,400	7 / 35	330	IS28SS21-0001	163	77.4
n-Nitroso-di-n-propylamine	370 - 2,400	1 / 35	100	IS28SS36-0001	283	219
n-Nitrosodiphenylamine	370 - 2,400	10 / 35	12,000	IS28SS19-0001	580	1,992
Explosives (UG/KG)						
1,3,5-Trinitrobenzene	100 - 100	1 / 35	670	IS28SS11-0001	67.7	105
1,3-Dinitrobenzene	100 - 100	0 / 35	--	--	50.0	0.0
2,4,6-Trinitrotoluene	100 - 100	4 / 35	450	IS28SS24-0001	78.6	90.4
2,4-Dinitrotoluene	100 - 100	4 / 35	230	IS28SS24-0001	63.1	42.9
2,6-Dinitrotoluene	100 - 100	0 / 35	--	--	50.0	0.0
2-Amino-4,6-dinitrotoluene	100 - 100	0 / 35	--	--	50.0	0.0
2-Nitrotoluene	200 - 200	0 / 35	--	--	100	0.0
3-Nitrotoluene	200 - 200	0 / 35	--	--	100	0.0
4-Amino-2,6-dinitrotoluene	100 - 100	0 / 35	--	--	50.0	0.0
4-Nitrotoluene	200 - 200	0 / 35	--	--	100	0.0
HMX	200 - 200	1 / 35	230	IS28SS37-0001	104	22.0
Nitrobenzene	100 - 100	8 / 35	190	IS28SS42-0001	62.8	31.6
Nitroglycerin	5,500 - 10,000	0 / 35	--	--	3,480	631
Nitroguanidine	130 - 130	0 / 35	--	--	65.0	0.0
PETN	500 - 500	0 / 35	--	--	250	0.0
Perchlorate	40.0 - 430	0 / 35	--	--	37.8	39.3
RDX	200 - 200	0 / 35	--	--	100	0.0
Tetryl	200 - 200	2 / 35	620	IS28SS24-0001	116	88.0
Volatile Organic Compounds (UG/KG)						
1,1,1-Trichloroethane	10.0 - 23.0	0 / 35	--	--	7.03	1.65
1,1,2,2-Tetrachloroethane	10.0 - 23.0	0 / 35	--	--	7.03	1.65
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10.0 - 23.0	0 / 35	--	--	7.03	1.65
1,1,2-Trichloroethane	10.0 - 23.0	0 / 35	--	--	7.03	1.65
1,1-Dichloroethane	10.0 - 23.0	0 / 35	--	--	7.03	1.65
1,1-Dichloroethene	10.0 - 23.0	0 / 35	--	--	7.03	1.65

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 7-4
Surface Soil Summary Statistics
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
1,2,4-Trichlorobenzene	10.0 - 23.0	0 / 35	--	--	5.50	3.46
1,2-Dibromo-3-chloropropane	10.0 - 23.0	0 / 35	--	--	7.03	1.65
1,2-Dibromoethane	10.0 - 23.0	0 / 35	--	--	7.03	1.65
1,2-Dichlorobenzene	10.0 - 23.0	0 / 35	--	--	6.69	2.29
1,2-Dichloroethane	10.0 - 23.0	0 / 35	--	--	7.03	1.65
1,2-Dichloroethene (total)	10.0 - 23.0	8 / 15	3.00	IS28SS33-0001	2.47	1.43
1,2-Dichloropropane	10.0 - 23.0	0 / 35	--	--	7.03	1.65
1,3-Dichlorobenzene	10.0 - 23.0	0 / 35	--	--	6.86	2.01
1,4-Dichlorobenzene	10.0 - 23.0	0 / 35	--	--	6.69	2.30
2-Butanone	10.0 - 23.0	0 / 35	--	--	7.03	1.65
2-Hexanone	10.0 - 23.0	0 / 35	--	--	7.03	1.65
4-Methyl-2-pentanone	10.0 - 23.0	0 / 35	--	--	7.03	1.65
Acetone	10.0 - 23.0	0 / 35	--	--	5.49	2.35
Benzene	10.0 - 23.0	0 / 35	--	--	7.03	1.65
Bromodichloromethane	10.0 - 23.0	0 / 35	--	--	7.03	1.65
Bromoform	10.0 - 23.0	0 / 35	--	--	7.03	1.65
Bromomethane	10.0 - 23.0	0 / 35	--	--	7.03	1.65
Carbon disulfide	10.0 - 23.0	0 / 35	--	--	7.03	1.65
Carbon tetrachloride	10.0 - 23.0	0 / 35	--	--	7.03	1.65
Chlorobenzene	10.0 - 23.0	0 / 35	--	--	7.03	1.65
Chloroethane	10.0 - 23.0	0 / 35	--	--	7.03	1.65
Chloroform	10.0 - 23.0	0 / 35	--	--	7.03	1.65
Chloromethane	10.0 - 23.0	0 / 35	--	--	7.03	1.65
Cumene	10.0 - 23.0	1 / 35	7.00	IS28SS41-0001	6.90	1.46
Cyclohexane	10.0 - 23.0	0 / 35	--	--	7.03	1.65
Dibromochloromethane	10.0 - 23.0	0 / 35	--	--	7.03	1.65
Dichlorodifluoromethane(Freon-12)	10.0 - 23.0	0 / 35	--	--	7.03	1.65
Ethylbenzene	10.0 - 23.0	0 / 35	--	--	7.03	1.65
Methyl acetate	10.0 - 23.0	1 / 35	6.00	IS28SS37-0001	7.04	1.64

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 7-4
Surface Soil Summary Statistics
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Methyl-tert-butyl ether (MTBE)	10.0 - 23.0	19 / 35	11.0	IS28SS33-0001	4.58	2.87
Methylcyclohexane	10.0 - 23.0	0 / 35	--	--	7.03	1.65
Methylene chloride	10.0 - 23.0	0 / 35	--	--	7.45	6.67
Styrene	10.0 - 23.0	1 / 35	9.00	IS28SS27-0001	7.10	1.68
Tetrachloroethene	10.0 - 23.0	0 / 35	--	--	7.03	1.65
Toluene	10.0 - 23.0	0 / 35	--	--	7.01	1.64
Trichloroethene	10.0 - 23.0	0 / 35	--	--	6.54	2.32
Trichlorofluoromethane(Freon-11)	10.0 - 23.0	0 / 35	--	--	7.03	1.65
Vinyl chloride	10.0 - 23.0	0 / 35	--	--	7.03	1.65
Xylene, total	10.0 - 23.0	1 / 35	2.00	IS28SS21-0001	6.83	1.82
cis-1,2-Dichloroethene	10.0 - 23.0	8 / 35	3.00	IS28SS33-0001	4.66	2.16
cis-1,3-Dichloropropene	10.0 - 23.0	0 / 35	--	--	7.03	1.65
m- and p-Xylene	10.0 - 23.0	1 / 15	2.00	IS28SS21-0001	7.53	2.61
o-Xylene	10.0 - 23.0	0 / 15	--	--	8.00	2.14
trans-1,2-Dichloroethene	10.0 - 23.0	0 / 35	--	--	7.03	1.65
trans-1,3-Dichloropropene	10.0 - 23.0	0 / 35	--	--	7.03	1.65

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 7-5
Onsite Sediment Summary Statistics
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Inorganics (MG/KG)						
Aluminum	44.0 - 99.0	8 / 8	13,400	IS28SD02-0503	4,259	3,876
Antimony	13.0 - 30.0	1 / 8	0.40	IS28SD040006	0.21	0.098
Arsenic	2.20 - 5.00	7 / 8	220	IS28SD02-0503	49.2	73.3
Barium	44.0 - 99.0	8 / 8	166	IS28SD02-0503	53.7	52.6
Beryllium	1.10 - 2.50	2 / 8	0.26	IS28SD020006	0.19	0.12
Cadmium	1.10 - 2.50	6 / 8	28.0	IS28SD02-0503	9.44	8.84
Calcium	1,100 - 2,500	8 / 8	1,450	IS28SD01-0503	647	449
Chromium	2.20 - 5.00	8 / 8	18.3	IS28SD02-0503	10.7	5.06
Cobalt	11.0 - 25.0	8 / 8	11.7	IS28SD02-0503	5.13	2.94
Copper	5.40 - 12.0	7 / 8	111	IS28SD02-0503	55.8	39.7
Iron	22.0 - 50.0	8 / 8	31,900	IS28SD02-0503	11,565	9,554
Lead	0.66 - 15.0	8 / 8	827	IS28SD02-0503	372	313
Magnesium	1,100 - 2,500	8 / 8	1,160	IS28SD01-0503	609	366
Manganese	3.30 - 7.40	8 / 8	351	IS28SD030006	146	109
Mercury	0.085 - 0.35	2 / 8	0.48	IS28SD02-0503	0.14	0.18
Nickel	8.70 - 20.0	8 / 8	44.4	IS28SD01-0503	13.2	13.5
Potassium	1,100 - 2,500	7 / 8	614	IS28SD02-0503	264	178
Selenium	1.10 - 2.50	5 / 8	2.00	IS28SD02-0503	0.72	0.58
Silver	2.20 - 5.00	2 / 8	1.10	IS28SD01-0503	0.81	0.28
Sodium	1,100 - 2,500	0 / 8	--	--	30.6	18.2
Thallium	2.20 - 5.00	0 / 8	--	--	0.46	0.17
Vanadium	11.0 - 25.0	7 / 8	39.3	IS28SD02-0503	13.7	11.1
Zinc	4.40 - 99.0	8 / 8	14,200	IS28SD02-0503	5,762	5,172
Semivolatile Organic Compounds (UG/KG)						
1,1-Biphenyl	450 - 1,200	0 / 4	--	--	336	178
2,4,5-Trichlorophenol	1,100 - 3,200	0 / 4	--	--	875	491
2,4,6-Trichlorophenol	450 - 1,200	0 / 4	--	--	336	178
2,4-Dichlorophenol	450 - 1,200	0 / 4	--	--	336	178

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 7-5
Onsite Sediment Summary Statistics
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
2,4-Dimethylphenol	450 - 1,200	0 / 4	--	--	336	178
2,4-Dinitrophenol	1,100 - 3,200	0 / 4	--	--	875	491
2,4-Dinitrotoluene	450 - 1,200	1 / 4	820	IS28SD02-0503	391	287
2,6-Dinitrotoluene	450 - 1,200	0 / 4	--	--	336	178
2-Chloronaphthalene	450 - 1,200	0 / 4	--	--	336	178
2-Chlorophenol	450 - 1,200	0 / 4	--	--	336	178
2-Methylnaphthalene	450 - 1,200	0 / 4	--	--	336	178
2-Methylphenol	450 - 1,200	0 / 4	--	--	336	178
2-Nitroaniline	1,100 - 3,200	0 / 4	--	--	875	491
2-Nitrophenol	450 - 1,200	0 / 4	--	--	336	178
3,3'-Dichlorobenzidine	450 - 1,200	0 / 4	--	--	336	178
3-Nitroaniline	1,100 - 3,200	0 / 4	--	--	875	491
4,6-Dinitro-2-methylphenol	1,100 - 3,200	0 / 4	--	--	875	491
4-Bromophenyl-phenylether	450 - 1,200	0 / 4	--	--	336	178
4-Chloro-3-methylphenol	450 - 1,200	0 / 4	--	--	336	178
4-Chloroaniline	450 - 1,200	0 / 4	--	--	336	178
4-Chlorophenyl-phenylether	450 - 1,200	0 / 4	--	--	336	178
4-Methylphenol	450 - 1,200	0 / 4	--	--	336	178
4-Nitroaniline	1,100 - 3,200	0 / 4	--	--	875	491
4-Nitrophenol	1,100 - 3,200	0 / 4	--	--	875	491
Acenaphthene	450 - 1,200	0 / 4	--	--	336	178
Acenaphthylene	450 - 1,200	0 / 4	--	--	336	178
Acetophenone	450 - 1,200	0 / 4	--	--	336	178
Anthracene	450 - 1,200	0 / 4	--	--	336	178
Atrazine	450 - 1,200	0 / 4	--	--	336	178
Benzaldehyde	450 - 1,200	0 / 4	--	--	336	178
Benzo(a)anthracene	450 - 1,200	2 / 4	140	IS28SD02-0503	184	50.6
Benzo(a)pyrene	450 - 1,200	2 / 4	130	IS28SD02-0503	167	72.5
Benzo(b)fluoranthene	450 - 1,200	3 / 4	250	IS28SD02-0503	167	92.2

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 7-5
Onsite Sediment Summary Statistics
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Benzo(g,h,i)perylene	450 - 1,200	1 / 4	36.0	IS28SD03-0503	273	236
Benzo(k)fluoranthene	450 - 1,200	1 / 4	71.0	IS28SD03-0503	282	225
Bis(2-chloro-1-methylethyl) ether	450 - 1,200	0 / 4	--	--	336	178
Butylbenzylphthalate	450 - 1,200	1 / 4	28.0	IS28SD020006	286	237
Caprolactam	450 - 1,200	0 / 4	--	--	336	178
Carbazole	450 - 1,200	0 / 4	--	--	336	178
Chrysene	450 - 1,200	3 / 4	160	IS28SD02-0503	143	83.0
Di-n-butylphthalate	450 - 1,200	3 / 4	110	IS28SD02-0503	51.1	40.8
Di-n-octylphthalate	450 - 1,200	0 / 4	--	--	336	178
Dibenz(a,h)anthracene	450 - 1,200	0 / 4	--	--	336	178
Dibenzofuran	450 - 1,200	0 / 4	--	--	336	178
Diethylphthalate	450 - 1,200	0 / 4	--	--	336	178
Dimethyl phthalate	450 - 1,200	0 / 4	--	--	336	178
Fluoranthene	450 - 1,200	3 / 4	220	IS28SD02-0503	172	90.7
Fluorene	450 - 1,200	0 / 4	--	--	336	178
Hexachlorobenzene	450 - 1,200	0 / 4	--	--	336	178
Hexachlorobutadiene	450 - 1,200	0 / 4	--	--	336	178
Hexachlorocyclopentadiene	450 - 1,200	0 / 4	--	--	336	178
Hexachloroethane	450 - 1,200	0 / 4	--	--	336	178
Indeno(1,2,3-cd)pyrene	450 - 1,200	2 / 4	93.0	IS28SD02-0503	148	93.6
Isophorone	450 - 1,200	0 / 4	--	--	336	178
Naphthalene	450 - 1,200	0 / 4	--	--	336	178
Nitrobenzene	450 - 1,200	0 / 4	--	--	336	178
Pentachlorophenol	1,100 - 3,200	0 / 4	--	--	875	491
Phenanthrene	450 - 1,200	1 / 4	72.0	IS28SD02-0503	204	93.0
Phenol	450 - 1,200	0 / 4	--	--	336	178
Pyrene	450 - 1,200	3 / 4	230	IS28SD02-0503	167	91.0
bis(2-Chloroethoxy)methane	450 - 1,200	0 / 4	--	--	336	178
bis(2-Chloroethyl)ether	450 - 1,200	0 / 4	--	--	336	178

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 7-5
Onsite Sediment Summary Statistics
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
bis(2-Ethylhexyl)phthalate	450 - 1,200	0 / 4	--	--	87.8	115
n-Nitroso-di-n-propylamine	450 - 1,200	0 / 4	--	--	336	178
n-Nitrosodiphenylamine	450 - 1,200	1 / 4	220	IS28SD02-0503	241	32.8
Explosives (UG/KG)						
1,3,5-Trinitrobenzene	100 - 100	0 / 4	--	--	50.0	0.0
1,3-Dinitrobenzene	100 - 100	0 / 4	--	--	50.0	0.0
2,4,6-Trinitrotoluene	100 - 100	0 / 4	--	--	50.0	0.0
2,4-Dinitrotoluene	100 - 100	1 / 4	130	IS28SD02-0503	70.0	40.0
2,6-Dinitrotoluene	100 - 100	0 / 4	--	--	50.0	0.0
2-Amino-4,6-dinitrotoluene	100 - 100	1 / 4	59.0	IS28SD02-0503	52.3	4.50
2-Nitrotoluene	200 - 200	0 / 4	--	--	100	0.0
3-Nitrotoluene	200 - 200	0 / 4	--	--	100	0.0
4-Amino-2,6-dinitrotoluene	100 - 100	1 / 4	110	IS28SD02-0503	65.0	30.0
4-Nitrotoluene	200 - 200	0 / 4	--	--	100	0.0
HMX	200 - 200	0 / 4	--	--	100	0.0
Nitrobenzene	100 - 100	0 / 4	--	--	50.0	0.0
Nitroglycerin	6,000 - 13,000	1 / 4	25,000	IS28SD02-0503	8,638	10,909
Nitroguanidine	130 - 130	0 / 4	--	--	65.0	0.0
PETN	500 - 500	0 / 4	--	--	250	0.0
Perchlorate	40.0 - 49.0	0 / 4	--	--	21.1	2.25
RDX	200 - 200	0 / 4	--	--	100	0.0
Tetryl	200 - 200	0 / 4	--	--	100	0.0
Volatile Organic Compounds (UG/KG)						
1,1,1-Trichloroethane	13.0 - 34.0	0 / 3	--	--	10.2	5.92
1,1,2,2-Tetrachloroethane	13.0 - 34.0	0 / 3	--	--	10.2	5.92
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	13.0 - 34.0	0 / 3	--	--	10.2	5.92
1,1,2-Trichloroethane	13.0 - 34.0	0 / 3	--	--	10.2	5.92
1,1-Dichloroethane	13.0 - 34.0	0 / 3	--	--	10.2	5.92
1,1-Dichloroethene	13.0 - 34.0	0 / 3	--	--	10.2	5.92

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 7-5
Onsite Sediment Summary Statistics
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
1,2,4-Trichlorobenzene	13.0 - 34.0	0 / 3	--	--	10.2	5.92
1,2-Dibromo-3-chloropropane	13.0 - 34.0	0 / 3	--	--	10.2	5.92
1,2-Dibromoethane	13.0 - 34.0	0 / 3	--	--	10.2	5.92
1,2-Dichlorobenzene	13.0 - 34.0	0 / 3	--	--	10.2	5.92
1,2-Dichloroethane	13.0 - 34.0	0 / 3	--	--	10.2	5.92
1,2-Dichloroethene (total)	13.0 - 34.0	2 / 3	3.00	IS28SD02-0503	2.00	1.00
1,2-Dichloropropane	13.0 - 34.0	0 / 3	--	--	10.2	5.92
1,3-Dichlorobenzene	13.0 - 34.0	0 / 3	--	--	10.2	5.92
1,4-Dichlorobenzene	13.0 - 34.0	0 / 3	--	--	10.2	5.92
2-Butanone	13.0 - 34.0	0 / 3	--	--	10.2	5.92
2-Hexanone	13.0 - 34.0	0 / 3	--	--	10.2	5.92
4-Methyl-2-pentanone	13.0 - 34.0	0 / 3	--	--	10.2	5.92
Acetone	13.0 - 34.0	1 / 3	3.00	IS28SD03-0503	8.83	7.29
Benzene	13.0 - 34.0	0 / 3	--	--	10.2	5.92
Bromodichloromethane	13.0 - 34.0	0 / 3	--	--	10.2	5.92
Bromoform	13.0 - 34.0	0 / 3	--	--	10.2	5.92
Bromomethane	13.0 - 34.0	0 / 3	--	--	10.2	5.92
Carbon disulfide	13.0 - 34.0	0 / 3	--	--	10.2	5.92
Carbon tetrachloride	13.0 - 34.0	0 / 3	--	--	10.2	5.92
Chlorobenzene	13.0 - 34.0	0 / 3	--	--	10.2	5.92
Chloroethane	13.0 - 34.0	0 / 3	--	--	10.2	5.92
Chloroform	13.0 - 34.0	0 / 3	--	--	10.2	5.92
Chloromethane	13.0 - 34.0	0 / 3	--	--	10.2	5.92
Cumene	13.0 - 34.0	0 / 3	--	--	10.2	5.92
Cyclohexane	13.0 - 34.0	0 / 3	--	--	10.2	5.92
Dibromochloromethane	13.0 - 34.0	0 / 3	--	--	10.2	5.92
Dichlorodifluoromethane(Freon-12)	13.0 - 34.0	0 / 3	--	--	10.2	5.92
Ethylbenzene	13.0 - 34.0	0 / 3	--	--	10.2	5.92
Methyl acetate	13.0 - 34.0	0 / 3	--	--	10.2	5.92

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 7-5
Onsite Sediment Summary Statistics
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Methyl-tert-butyl ether (MTBE)	13.0 - 34.0	1 / 3	5.00	IS28SD03-0503	9.67	6.43
Methylcyclohexane	13.0 - 34.0	0 / 3	--	--	10.2	5.92
Methylene chloride	13.0 - 34.0	0 / 3	--	--	13.8	17.1
Styrene	13.0 - 34.0	0 / 3	--	--	10.2	5.92
Tetrachloroethene	13.0 - 34.0	0 / 3	--	--	10.2	5.92
Toluene	13.0 - 34.0	0 / 3	--	--	10.2	5.92
Trichloroethene	13.0 - 34.0	0 / 3	--	--	10.2	5.92
Trichlorofluoromethane(Freon-11)	13.0 - 34.0	0 / 3	--	--	10.2	5.92
Vinyl chloride	13.0 - 34.0	0 / 3	--	--	10.2	5.92
Xylene, total	13.0 - 34.0	0 / 3	--	--	10.2	5.92
cis-1,2-Dichloroethene	13.0 - 34.0	3 / 3	3.00	IS28SD02-0503	2.00	1.00
cis-1,3-Dichloropropene	13.0 - 34.0	0 / 3	--	--	10.2	5.92
m- and p-Xylene	13.0 - 34.0	0 / 3	--	--	10.2	5.92
o-Xylene	13.0 - 34.0	0 / 3	--	--	10.2	5.92
trans-1,2-Dichloroethene	13.0 - 34.0	0 / 3	--	--	10.2	5.92
trans-1,3-Dichloropropene	13.0 - 34.0	0 / 3	--	--	10.2	5.92

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 7-6
Surface Water Summary Statistics
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Inorganics (UG/L)						
Aluminum	200 - 200	0 / 3	--	--	44.3	48.3
Antimony	60.0 - 60.0	0 / 3	--	--	0.67	0.0
Arsenic	10.0 - 10.0	1 / 3	3.80	IS28SW02-0503	2.73	1.59
Barium	200 - 200	3 / 3	67.4	IS28SW01-0503	50.8	16.2
Beryllium	5.00 - 5.00	0 / 3	--	--	0.16	2.634E-09
Cadmium	5.00 - 5.00	3 / 3	7.60	IS28SW03-0503	7.07	0.68
Calcium	5,000 - 5,000	3 / 3	6,340	IS28SW01-0503	4,530	1,727
Chromium	10.0 - 10.0	0 / 3	--	--	0.29	0.0
Cobalt	50.0 - 50.0	2 / 3	2.20	IS28SW02-0503	1.31	0.81
Copper	25.0 - 25.0	1 / 3	16.6	IS28SW03-0503	9.98	7.93
Iron	100 - 100	2 / 3	6,600	IS28SW02-0503	2,275	3,746
Lead	3.00 - 3.00	1 / 3	61.5	IS28SW02-0503	21.8	34.4
Magnesium	5,000 - 5,000	3 / 3	1,820	IS28SW01-0503	1,282	542
Manganese	15.0 - 15.0	3 / 3	45.8	IS28SW02-0503	27.8	17.7
Mercury	0.20 - 0.20	0 / 3	--	--	0.045	0.015
Nickel	40.0 - 40.0	2 / 3	10.4	IS28SW01-0503	7.22	2.77
Potassium	5,000 - 5,000	1 / 3	1,320	IS28SW03-0503	898	371
Selenium	5.00 - 5.00	0 / 3	--	--	1.05	0
Silver	10.0 - 10.0	0 / 3	--	--	2.39	4.215E-08
Sodium	5,000 - 5,000	3 / 3	21,700	IS28SW01-0503	17,133	4,934
Thallium	10.0 - 10.0	0 / 3	--	--	2.78	0.10
Vanadium	50.0 - 50.0	0 / 3	--	--	2.35	0.0
Zinc	20.0 - 20.0	3 / 3	4,140	IS28SW02-0503	3,643	663
Dissolved Metals (UG/L)						
Aluminum	200 - 200	0 / 3	--	--	14.1	6.99
Antimony	60.0 - 60.0	0 / 3	--	--	0.67	0.0
Arsenic	10.0 - 10.0	0 / 3	--	--	1.77	1.50
Barium	200 - 200	3 / 3	63.8	IS28SW01-0503	50.5	13.3

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Table 7-6
Surface Water Summary Statistics
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Beryllium	5.00 - 5.00	0 / 3	--	--	0.16	2.634E-09
Cadmium	5.00 - 5.00	3 / 3	7.40	IS28SW02-0503	6.37	0.93
Calcium	5,000 - 5,000	3 / 3	6,240	IS28SW01-0503	4,623	1,525
Chromium	10.0 - 10.0	0 / 3	--	--	0.29	0.0
Cobalt	50.0 - 50.0	2 / 3	2.30	IS28SW02-0503	1.29	0.87
Copper	25.0 - 25.0	0 / 3	--	--	2.31	1.94
Iron	100 - 100	2 / 3	678	IS28SW02-0503	255	368
Lead	3.00 - 3.00	0 / 3	--	--	0.70	0.39
Magnesium	5,000 - 5,000	3 / 3	1,780	IS28SW01-0503	1,271	524
Manganese	15.0 - 15.0	3 / 3	44.2	IS28SW02-0503	27.0	17.9
Mercury	0.20 - 0.20	0 / 3	--	--	0.037	0.019
Nickel	40.0 - 40.0	2 / 3	4.50	IS28SW02-0503	4.78	0.96
Potassium	5,000 - 5,000	1 / 3	1,150	IS28SW03-0503	792	328
Selenium	5.00 - 5.00	0 / 3	--	--	1.05	0
Silver	10.0 - 10.0	0 / 3	--	--	2.39	4.215E-08
Sodium	5,000 - 5,000	3 / 3	21,100	IS28SW01-0503	18,000	3,843
Thallium	10.0 - 10.0	0 / 3	--	--	3.20	1.23
Vanadium	50.0 - 50.0	0 / 3	--	--	2.35	0.0
Zinc	20.0 - 20.0	3 / 3	4,420	IS28SW02-0503	3,687	773
Semivolatile Organic Compounds (UG/L)						
1,1-Biphenyl	10.0 - 10.0	0 / 3	--	--	5.00	0.0
2,4,5-Trichlorophenol	25.0 - 25.0	0 / 3	--	--	12.5	0.0
2,4,6-Trichlorophenol	10.0 - 10.0	0 / 3	--	--	5.00	0.0
2,4-Dichlorophenol	10.0 - 10.0	0 / 3	--	--	5.00	0.0
2,4-Dimethylphenol	10.0 - 10.0	0 / 3	--	--	5.00	0.0
2,4-Dinitrophenol	25.0 - 25.0	0 / 3	--	--	12.5	0.0
2,4-Dinitrotoluene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
2,6-Dinitrotoluene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
2-Chloronaphthalene	10.0 - 10.0	0 / 3	--	--	5.00	0.0

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 7-6
Surface Water Summary Statistics
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
2-Chlorophenol	10.0 - 10.0	0 / 3	--	--	5.00	0.0
2-Methylnaphthalene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
2-Methylphenol	10.0 - 10.0	0 / 3	--	--	5.00	0.0
2-Nitroaniline	25.0 - 25.0	0 / 3	--	--	12.5	0.0
2-Nitrophenol	10.0 - 10.0	0 / 3	--	--	5.00	0.0
3,3'-Dichlorobenzidine	10.0 - 10.0	0 / 3	--	--	5.00	0.0
3-Nitroaniline	25.0 - 25.0	0 / 3	--	--	12.5	0.0
4,6-Dinitro-2-methylphenol	25.0 - 25.0	0 / 3	--	--	12.5	0.0
4-Bromophenyl-phenylether	10.0 - 10.0	0 / 3	--	--	5.00	0.0
4-Chloro-3-methylphenol	10.0 - 10.0	0 / 3	--	--	5.00	0.0
4-Chloroaniline	10.0 - 10.0	0 / 3	--	--	5.00	0.0
4-Chlorophenyl-phenylether	10.0 - 10.0	0 / 3	--	--	5.00	0.0
4-Methylphenol	10.0 - 10.0	0 / 3	--	--	5.00	0.0
4-Nitroaniline	25.0 - 25.0	0 / 3	--	--	12.5	0.0
4-Nitrophenol	25.0 - 25.0	0 / 3	--	--	12.5	0.0
Acenaphthene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Acenaphthylene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Acetophenone	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Anthracene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Atrazine	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Benzaldehyde	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Benzo(a)anthracene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Benzo(a)pyrene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Benzo(b)fluoranthene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Benzo(g,h,i)perylene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Benzo(k)fluoranthene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Bis(2-chloro-1-methylethyl) ether	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Butylbenzylphthalate	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Caprolactam	10.0 - 10.0	0 / 3	--	--	5.00	0.0

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Table 7-6
Surface Water Summary Statistics
Site 28
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Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Carbazole	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Chrysene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Di-n-butylphthalate	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Di-n-octylphthalate	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Dibenz(a,h)anthracene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Dibenzofuran	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Diethylphthalate	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Dimethyl phthalate	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Fluoranthene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Fluorene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Hexachlorobenzene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Hexachlorobutadiene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Hexachlorocyclopentadiene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Hexachloroethane	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Indeno(1,2,3-cd)pyrene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Isophorone	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Naphthalene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Nitrobenzene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Pentachlorophenol	25.0 - 25.0	0 / 3	--	--	12.5	0.0
Phenanthrene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Phenol	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Pyrene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
bis(2-Chloroethoxy)methane	10.0 - 10.0	0 / 3	--	--	5.00	0.0
bis(2-Chloroethyl)ether	10.0 - 10.0	0 / 3	--	--	5.00	0.0
bis(2-Ethylhexyl)phthalate	10.0 - 10.0	0 / 3	--	--	5.00	0.0
n-Nitroso-di-n-propylamine	10.0 - 10.0	0 / 3	--	--	5.00	0.0
n-Nitrosodiphenylamine	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Explosives (UG/L)						
1,3,5-Trinitrobenzene	0.26 - 0.26	0 / 3	--	--	0.13	1.863E-09

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 7-6
Surface Water Summary Statistics
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
1,3-Dinitrobenzene	0.26 - 0.26	0 / 3	--	--	0.13	1.863E-09
2,4,6-Trinitrotoluene	0.26 - 0.26	0 / 3	--	--	0.13	1.863E-09
2,4-Dinitrotoluene	0.26 - 0.26	0 / 3	--	--	0.13	1.863E-09
2,6-Dinitrotoluene	0.26 - 0.26	0 / 3	--	--	0.13	1.863E-09
2-Amino-4,6-dinitrotoluene	0.26 - 0.26	0 / 3	--	--	0.13	1.863E-09
2-Nitrotoluene	0.52 - 0.52	0 / 3	--	--	0.26	3.725E-09
3-Nitrotoluene	0.52 - 0.52	0 / 3	--	--	0.26	3.725E-09
4-Amino-2,6-dinitrotoluene	0.26 - 0.26	0 / 3	--	--	0.13	1.863E-09
4-Nitrotoluene	0.52 - 0.52	0 / 3	--	--	0.26	3.725E-09
HMX	0.52 - 0.52	0 / 3	--	--	0.26	3.725E-09
Nitrobenzene	0.26 - 0.26	1 / 3	0.15	IS28SW02-0503	0.14	0.011547
Nitroglycerin	1,000 - 1,000	0 / 3	--	--	500	0
Nitroguanidine	10.0 - 10.0	0 / 3	--	--	5.00	0
PETN	1.30 - 1.30	0 / 3	--	--	0.65	0
Perchlorate	4.00 - 4.00	0 / 3	--	--	2.00	0
RDX	0.52 - 0.52	0 / 3	--	--	0.26	3.725E-09
Tetryl	0.52 - 0.52	0 / 3	--	--	0.26	3.725E-09
Volatile Organic Compounds (UG/L)						
1,1,1-Trichloroethane	10.0 - 10.0	0 / 3	--	--	5.00	0.0
1,1,2,2-Tetrachloroethane	10.0 - 10.0	0 / 3	--	--	5.00	0.0
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10.0 - 10.0	0 / 3	--	--	5.00	0.0
1,1,2-Trichloroethane	10.0 - 10.0	0 / 3	--	--	5.00	0.0
1,1-Dichloroethane	10.0 - 10.0	0 / 3	--	--	5.00	0.0
1,1-Dichloroethene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
1,2,4-Trichlorobenzene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
1,2-Dibromo-3-chloropropane	10.0 - 10.0	0 / 1	--	--	5.00	0.0
1,2-Dibromoethane	10.0 - 10.0	0 / 3	--	--	5.00	0.0
1,2-Dichlorobenzene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
1,2-Dichloroethane	10.0 - 10.0	0 / 3	--	--	5.00	0.0

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Table 7-6
Surface Water Summary Statistics
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
1,2-Dichloroethene (total)	10.0 - 10.0	0 / 2	--	--	5.00	0.0
1,2-Dichloropropane	10.0 - 10.0	0 / 3	--	--	5.00	0.0
1,3-Dichlorobenzene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
1,4-Dichlorobenzene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
2-Butanone	10.0 - 10.0	0 / 3	--	--	5.00	0.0
2-Hexanone	10.0 - 10.0	0 / 3	--	--	5.00	0.0
4-Methyl-2-pentanone	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Acetone	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Benzene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Bromodichloromethane	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Bromoform	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Bromomethane	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Carbon disulfide	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Carbon tetrachloride	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Chlorobenzene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Chloroethane	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Chloroform	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Chloromethane	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Cumene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Cyclohexane	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Dibromochloromethane	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Dichlorodifluoromethane(Freon-12)	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Ethylbenzene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Methyl acetate	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Methyl-tert-butyl ether (MTBE)	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Methylcyclohexane	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Methylene chloride	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Styrene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Tetrachloroethene	10.0 - 10.0	0 / 3	--	--	5.00	0.0

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 7-6
Surface Water Summary Statistics
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Toluene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Trichloroethene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Trichlorofluoromethane(Freon-11)	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Vinyl chloride	10.0 - 10.0	0 / 3	--	--	5.00	0.0
Xylene, total	10.0 - 10.0	0 / 3	--	--	5.00	0.0
cis-1,2-Dichloroethene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
cis-1,3-Dichloropropene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
m- and p-Xylene	10.0 - 10.0	0 / 2	--	--	5.00	0.0
o-Xylene	10.0 - 10.0	0 / 2	--	--	5.00	0.0
trans-1,2-Dichloroethene	10.0 - 10.0	0 / 3	--	--	5.00	0.0
trans-1,3-Dichloropropene	10.0 - 10.0	0 / 3	--	--	5.00	0.0

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 7-7
Mattawoman Creek Sediment Summary Statistics
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Inorganics (MG/KG)						
Aluminum	34.0 - 110	10 / 10	18,400	IS28SD120006	8,831	6,340
Antimony	10.0 - 32.0	0 / 10	--	--	0.21	0.082
Arsenic	1.70 - 5.30	7 / 10	8.20	IS28SD110006	4.00	3.18
Barium	34.0 - 110	10 / 10	134	IS28SD120006	67.9	47.5
Beryllium	0.84 - 2.60	9 / 10	1.00	IS28SD120006	0.60	0.36
Cadmium	0.84 - 2.60	0 / 10	--	--	0.53	0.26
Calcium	840 - 2,600	10 / 10	2,060	IS28SD110006	1,253	636
Chromium	1.70 - 5.30	10 / 10	27.8	IS28SD120006	15.6	9.78
Cobalt	8.40 - 26.0	10 / 10	13.2	IS28SD130006	8.82	4.29
Copper	4.20 - 13.0	10 / 10	23.9	IS28SD110006	12.7	7.09
Iron	17.0 - 53.0	10 / 10	26,600	IS28SD130006	16,288	8,688
Lead	0.51 - 1.60	10 / 10	36.7	IS28SD110006	15.4	10.5
Magnesium	840 - 2,600	10 / 10	2,540	IS28SD130006	1,339	918
Manganese	2.50 - 8.00	10 / 10	891	IS28SD130006	342	253
Mercury	0.073 - 0.29	1 / 10	0.44	IS28SD110006	0.11	0.13
Nickel	6.80 - 21.0	10 / 10	20.9	IS28SD120006	11.0	7.55
Potassium	840 - 2,600	8 / 10	1,230	IS28SD140006	663	440
Selenium	0.84 - 2.60	1 / 10	0.85	IS28SD100006	0.42	0.23
Silver	1.70 - 5.30	9 / 10	4.00	IS28SD110006	2.07	1.08
Sodium	840 - 2,600	0 / 10	--	--	108	70.2
Thallium	1.70 - 5.30	0 / 10	--	--	0.58	0.25
Vanadium	8.40 - 26.0	10 / 10	38.2	IS28SD120006	24.8	11.3
Zinc	3.40 - 11.0	10 / 10	159	IS28SD110006	62.3	47.0
Semivolatile Organic Compounds (UG/KG)						
1,1-Biphenyl	400 - 1,000	0 / 2	--	--	350	212
2,4,5-Trichlorophenol	1,000 - 2,500	0 / 2	--	--	875	530
2,4,6-Trichlorophenol	400 - 1,000	0 / 2	--	--	350	212
2,4-Dichlorophenol	400 - 1,000	0 / 2	--	--	350	212

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 7-7
Mattawoman Creek Sediment Summary Statistics
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
2,4-Dimethylphenol	400 - 1,000	0 / 2	--	--	350	212
2,4-Dinitrophenol	1,000 - 2,500	0 / 2	--	--	875	530
2,4-Dinitrotoluene	400 - 1,000	0 / 2	--	--	350	212
2,6-Dinitrotoluene	400 - 1,000	0 / 2	--	--	350	212
2-Chloronaphthalene	400 - 1,000	0 / 2	--	--	350	212
2-Chlorophenol	400 - 1,000	0 / 2	--	--	350	212
2-Methylnaphthalene	400 - 1,000	0 / 2	--	--	350	212
2-Methylphenol	400 - 1,000	0 / 2	--	--	350	212
2-Nitroaniline	1,000 - 2,500	0 / 2	--	--	875	530
2-Nitrophenol	400 - 1,000	0 / 2	--	--	350	212
3,3'-Dichlorobenzidine	400 - 1,000	0 / 2	--	--	350	212
3-Nitroaniline	1,000 - 2,500	0 / 2	--	--	875	530
4,6-Dinitro-2-methylphenol	1,000 - 2,500	0 / 2	--	--	875	530
4-Bromophenyl-phenylether	400 - 1,000	0 / 2	--	--	350	212
4-Chloro-3-methylphenol	400 - 1,000	0 / 2	--	--	350	212
4-Chloroaniline	400 - 1,000	0 / 2	--	--	350	212
4-Chlorophenyl-phenylether	400 - 1,000	0 / 2	--	--	350	212
4-Methylphenol	400 - 1,000	0 / 2	--	--	350	212
4-Nitroaniline	1,000 - 2,500	0 / 2	--	--	875	530
4-Nitrophenol	1,000 - 2,500	0 / 2	--	--	875	530
Acenaphthene	400 - 1,000	0 / 2	--	--	350	212
Acenaphthylene	400 - 1,000	0 / 2	--	--	350	212
Acetophenone	400 - 1,000	0 / 2	--	--	350	212
Anthracene	400 - 1,000	0 / 2	--	--	350	212
Atrazine	400 - 1,000	0 / 2	--	--	350	212
Benzaldehyde	400 - 1,000	1 / 2	160	IS28SD110006	180	28.3
Benzo(a)anthracene	400 - 1,000	0 / 2	--	--	350	212
Benzo(a)pyrene	400 - 1,000	0 / 2	--	--	350	212
Benzo(b)fluoranthene	400 - 1,000	1 / 2	70.0	IS28SD110006	135	91.9

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Table 7-7
Mattawoman Creek Sediment Summary Statistics
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
Benzo(g,h,i)perylene	400 - 1,000	0 / 2	--	--	350	212
Benzo(k)fluoranthene	400 - 1,000	0 / 2	--	--	350	212
Bis(2-chloro-1-methylethyl) ether	400 - 1,000	0 / 2	--	--	350	212
Butylbenzylphthalate	400 - 1,000	0 / 2	--	--	350	212
Caprolactam	400 - 1,000	0 / 2	--	--	350	212
Carbazole	400 - 1,000	0 / 2	--	--	350	212
Chrysene	400 - 1,000	1 / 2	67.0	IS28SD110006	134	94.0
Di-n-butylphthalate	400 - 1,000	0 / 2	--	--	113	123
Di-n-octylphthalate	400 - 1,000	0 / 2	--	--	350	212
Dibenz(a,h)anthracene	400 - 1,000	0 / 2	--	--	350	212
Dibenzofuran	400 - 1,000	0 / 2	--	--	350	212
Diethylphthalate	400 - 1,000	1 / 2	37.0	IS28SD090006	269	327
Dimethyl phthalate	400 - 1,000	0 / 2	--	--	350	212
Fluoranthene	400 - 1,000	1 / 2	92.0	IS28SD110006	146	76.4
Fluorene	400 - 1,000	0 / 2	--	--	350	212
Hexachlorobenzene	400 - 1,000	0 / 2	--	--	350	212
Hexachlorobutadiene	400 - 1,000	0 / 2	--	--	350	212
Hexachlorocyclopentadiene	400 - 1,000	0 / 2	--	--	350	212
Hexachloroethane	400 - 1,000	0 / 2	--	--	350	212
Indeno(1,2,3-cd)pyrene	400 - 1,000	0 / 2	--	--	350	212
Isophorone	400 - 1,000	0 / 2	--	--	350	212
Naphthalene	400 - 1,000	0 / 2	--	--	350	212
Nitrobenzene	400 - 1,000	0 / 2	--	--	350	212
Pentachlorophenol	1,000 - 2,500	0 / 2	--	--	875	530
Phenanthrene	400 - 1,000	0 / 2	--	--	350	212
Phenol	400 - 1,000	0 / 2	--	--	350	212
Pyrene	400 - 1,000	1 / 2	97.0	IS28SD110006	149	72.8
bis(2-Chloroethoxy)methane	400 - 1,000	0 / 2	--	--	350	212
bis(2-Chloroethyl)ether	400 - 1,000	0 / 2	--	--	350	212

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 7-7
Mattawoman Creek Sediment Summary Statistics
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean[1]	Standard Deviation of Mean
bis(2-Ethylhexyl)phthalate	400 - 1,000	1 / 2	29.0	IS28SD090006	49.5	29.0
n-Nitroso-di-n-propylamine	400 - 1,000	0 / 2	--	--	350	212
n-Nitrosodiphenylamine	400 - 1,000	1 / 2	79.0	IS28SD110006	140	85.6
Explosives (UG/KG)						
1,3,5-Trinitrobenzene	100 - 100	0 / 2	--	--	50.0	0.0
1,3-Dinitrobenzene	100 - 100	0 / 2	--	--	50.0	0.0
2,4,6-Trinitrotoluene	100 - 100	0 / 2	--	--	50.0	0.0
2,4-Dinitrotoluene	100 - 100	0 / 2	--	--	50.0	0.0
2,6-Dinitrotoluene	100 - 100	0 / 2	--	--	50.0	0.0
2-Amino-4,6-dinitrotoluene	100 - 100	0 / 2	--	--	50.0	0.0
2-Nitrotoluene	200 - 200	0 / 2	--	--	100	0.0
3-Nitrotoluene	200 - 200	0 / 2	--	--	100	0.0
4-Amino-2,6-dinitrotoluene	100 - 100	0 / 2	--	--	50.0	0.0
4-Nitrotoluene	200 - 200	0 / 2	--	--	100	0.0
HMX	200 - 200	0 / 2	--	--	100	0.0
Nitrobenzene	100 - 100	0 / 2	--	--	50.0	0.0
Nitroglycerin	5,700 - 14,000	0 / 2	--	--	4,925	2,934
Nitroguanidine	130 - 130	0 / 2	--	--	65.0	0.0
PETN	500 - 500	0 / 2	--	--	250	0.0
Perchlorate	40.0 - 80.0	0 / 2	--	--	30.0	14.1
RDX	200 - 200	0 / 2	--	--	100	0.0
Tetryl	200 - 200	0 / 2	--	--	100	0.0

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 7-8
Ingestion Screening Values for Mammals
Site 28
IHDIV-NSWC

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Inorganics								
Arsenic	mouse	0.03	3 generations	oral in water	reproduction	1.26	0.25	Sample et al. 1996
Arsenic	dog	10.0	2 years	oral in diet	systemic	6.00	1.20	ATSDR 1993a
Cadmium	rat	0.303	6 weeks	oral (gavage)	reproduction	10.0	1.00	Sample et al. 1996
Cadmium	dog	10.0	3 months	oral in diet	reproduction	3.75	0.75	ATSDR 1999a
Chromium	rat	0.35	3 months	oral in water	mortality	131	26.3	Sample et al. 1996
Chromium	rat	0.35	1 year	oral in water	body weight/intake	16.4	3.28	Sample et al. 1996
Copper	mouse	0.03	1 month + GD 0-19	oral in diet	developmental	104	78.0	ATSDR 1990a
Copper	mink	1.00	357 days	oral in diet	reproduction	15.1	11.7	Sample et al. 1996
Lead	rat	0.35	3 generations	oral in diet	reproduction	80.0	8.00	Sample et al. 1996
Mercury	rat	0.35	3 generations	oral in diet	reproduction	0.16	0.032	Sample et al. 1996
Mercury	mink	1.00	93 days	oral in diet	survival/weight loss	0.25	0.15	Sample et al. 1996
Nickel	rat	0.35	3 generations	oral in diet	reproduction	80.0	40.0	Sample et al. 1996
Nickel	dog	10.0	2 years	oral in diet	systemic	62.5	25.0	ATSDR 1997a
Selenium	rat	0.35	1 year	oral in water	reproduction	0.33	0.20	Sample et al. 1996
Silver	rat	0.35	2 weeks	oral in water	survival	45.3	9.06	ATSDR 1990b
Tin	mouse	0.03	GD 6-15	oral (gavage)	reproduction	35.0	23.4	Sample et al. 1996
Zinc	rat	0.35	GD 1-16	oral in diet	reproduction	320	160	Sample et al. 1996
Zinc	mink	1.00	25 weeks	oral	reproduction	104	20.8	ATSDR 1994a
Semivolatile Organics								
1,2,4-Trichlorobenzene	rat	0.35	3 generations	oral in water	reproduction	106	53	Coulston and Kolbye 1994
1,2-Dichlorobenzene	rat	0.35	chronic	oral (gavage)	liver/kidney	429	85.7	Coulston and Kolbye 1994
1,3-Dichlorobenzene	rat	0.35	chronic	oral (gavage)	liver/kidney	429	85.7	Coulston and Kolbye 1994
1,4-Dichlorobenzene	rat	0.35	GD 6-15	oral (gavage)	developmental	500	250	ATSDR 1998a
4-Bromophenyl-phenylether	--	--	--	--	--	NA	NA	--
4-Chlorophenyl-phenylether	--	--	--	--	--	NA	NA	--
Acenaphthene	mouse	0.03	13 weeks	oral (gavage)	reproduction	700	350	ATSDR 1995a
Acenaphthylene	mouse	0.03	13 weeks	oral (gavage)	reproduction	700	350	ATSDR 1995a
Anthracene	mouse	0.03	13 weeks	oral (gavage)	reproduction	5,000	1,000	ATSDR 1995a
Benzo(a)anthracene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Benzo(a)pyrene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Benzo(b)fluoranthene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Benzo(g,h,i)perylene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Benzo(k)fluoranthene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Chrysene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Dibenz(a,h)anthracene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Fluoranthene	mouse	0.03	13 weeks	oral (gavage)	reproduction	2,500	500	ATSDR 1995a
Fluorene	mouse	0.03	13 weeks	oral (gavage)	reproduction	2,500	500	ATSDR 1995a
Hexachlorobenzene	rat	0.35	4 generations	oral in diet	reproduction	2.00	1.00	ATSDR 1996b
Hexachlorobenzene	dog	10.0	1 year	oral	systemic	12.0	1.20	ATSDR 1996b
Hexachlorobutadiene	rat	0.35	GD 1-22; LD 1-21	oral in diet	developmental	20.0	2.00	ATSDR 1994c
Hexachlorocyclopentadiene	mouse	0.03	GD 6-15	oral (gavage)	developmental	375	75.0	ATSDR 1999b
Hexachloroethane	rat	0.35	GD 6-16	oral (gavage)	reproduction	500	100	ATSDR 1997b
Indeno(1,2,3-cd)pyrene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Pentachlorophenol	rat	0.35	2 generations	oral in diet	developmental	25.0	5.00	ATSDR 1994d
Phenanthrene	mouse	0.03	13 weeks	oral (gavage)	reproduction	2,500	500	ATSDR 1995a
Pyrene	mouse	0.03	GD 7-16	oral (gavage)	reproduction	10.0	2.00	Sample et al. 1996
Volatile Organics								
1,1,2,2-Tetrachloroethane	rat	0.35	78 weeks	oral (gavage)	reproduction	380	76.0	ATSDR 1996a

Table 7-9
Ingestion Screening Values for Birds
Site 28
IHDIV-NSWC

Chemical	Test Organism	Body Weight (kg)	Duration	Exposure Route	Effect/Endpoint	LOAEL (mg/kg/d)	NOAEL (mg/kg/d)	Reference
Inorganics								
Arsenic	brown-headed cowbird	0.049	7 months	oral in diet	survival	7.38	2.46	Sample et al. 1996
Arsenic	mallard	1.00	128 days	oral in diet	survival	12.8	5.14	Sample et al. 1996
Cadmium	mallard	1.15	90 days	oral in diet	reproduction	20.0	1.45	Sample et al. 1996
Chromium	American black duck	1.25	10 months	oral in diet	reproduction	5.00	1.00	Sample et al. 1996
Copper	chicken (chicks)	0.534	10 weeks	oral in diet	growth/survival	61.7	47.0	Sample et al. 1996
Lead	Japanese quail	0.15	12 weeks	oral in diet	reproduction	11.3	1.13	Sample et al. 1996
Lead	American kestrel	0.13	7 months	oral in diet	reproduction	19.3	3.85	Sample et al. 1996
Mercury	red-tailed hawk	1.10	12 weeks	oral in diet	survival/neurological	1.20	0.49	USEPA 1995b
Mercury	Japanese quail	0.15	1 year	oral in diet	reproduction	0.90	0.45	Sample et al. 1996
Mercury	mallard	1.00	3 generations	oral in diet	reproduction	0.078	0.026	USEPA 1997b
Nickel	mallard	0.782	90 days	oral in diet	growth/survival	107	77.4	Sample et al. 1996
Selenium	black-crowned night-heron	0.88	94 days	oral in diet	reproduction	9.00	1.80	Sample et al. 1996
Selenium	mallard	1.00	100 days	oral in diet	reproduction	0.80	0.40	Sample et al. 1996
Selenium	screech owl	0.20	13.7 weeks	oral in diet	reproduction	1.50	0.44	Sample et al. 1996
Silver	mallard	1.10	14 days	oral in diet	survival	178	35.6	USEPA 1999
Silver	chicken (chicks)	0.80	not specified	oral in diet	growth	35.0	7.00	Eisler 1996
Tin	Japanese quail	0.15	6 weeks	oral in diet	reproduction	16.9	6.76	Sample et al. 1996
Zinc	chicken	1.94	44 weeks	oral in diet	reproduction	131	14.5	Sample et al. 1996
Semivolatile Organics								
1,2,4-Trichlorobenzene	northern bobwhite	0.19	14 days	oral	survival	161	32.2	TERRETOX 2002
1,2-Dichlorobenzene	northern bobwhite	0.19	14 days	oral	survival	161	32.2	TERRETOX 2002
1,3-Dichlorobenzene	northern bobwhite	0.19	14 days	oral	survival	161	32.2	TERRETOX 2002
1,4-Dichlorobenzene	northern bobwhite	0.19	14 days	oral	survival	161	32.2	TERRETOX 2002
4-Bromophenyl-phenylether	--	--	--	--	--	NA	NA	--
4-Chlorophenyl-phenylether	--	--	--	--	--	NA	NA	--
Acenaphthene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Acenaphthylene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Anthracene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Benzo(a)anthracene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Benzo(a)pyrene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Benzo(b)fluoranthene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Benzo(g,h,i)perylene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Benzo(k)fluoranthene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Chrysene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Dibenz(a,h)anthracene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Fluoranthene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Fluorene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Hexachlorobenzene	Japanese quail	0.15	90 days	oral in diet	reproduction	0.565	0.113	Coulston and Kolbye 1994; TERRETOX 2002
Hexachlorobutadiene	Japanese quail	0.15	90 days	oral in diet	reproduction	17.0	3.39	Coulston and Kolbye 1994; TERRETOX 2002
Hexachlorocyclopentadiene	--	--	--	--	--	NA	NA	--
Hexachloroethane	--	--	--	--	--	NA	NA	--
Indeno(1,2,3-cd)pyrene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Pentachlorophenol	chicken	1.50	8 weeks	oral in diet	systemic/growth	8.52	4.26	Eisler 1989
Phenanthrene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Pyrene	chicken	1.50	35 days	oral in diet	reproduction	35.5	7.10	Rigdon and Neal 1963
Volatile Organics								
1,1,2,2-Tetrachloroethane	--	--	--	--	--	NA	NA	--

Table 7-10
Soil Bioconcentration Factors for Plants and Soil Invertebrates - Step 2
Site 28
IHDIV-NSWC

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)	
	Value	Reference	Value	Reference
Inorganics				
Arsenic	1.103	Bechtel Jacobs 1998a	0.523	Sample et al. 1998a
Cadmium	3.250	Bechtel Jacobs 1998a	40.69	Sample et al. 1998a
Chromium	0.084	Bechtel Jacobs 1998a	3.162	Sample et al. 1998a
Copper	0.625	Bechtel Jacobs 1998a	1.531	Sample et al. 1998a
Lead	0.468	Bechtel Jacobs 1998a	1.522	Sample et al. 1998a
Mercury	5.000	Bechtel Jacobs 1998a	20.63	Sample et al. 1998a
Nickel	1.411	Bechtel Jacobs 1998a	4.730	Sample et al. 1998a
Selenium	3.012	Bechtel Jacobs 1998a	1.340	Sample et al. 1998a
Silver	0.037	Bechtel Jacobs 1998a	15.34	Sample et al. 1998a
Tin	0.030	Baes et al. 1984	1.000	--
Zinc	1.820	Bechtel Jacobs 1998a	12.89	Sample et al. 1998a
Semivolatile Organics				
1,2,4-Trichlorobenzene	0.2186	Travis and Arms 1988	0.56	Beyer 1996
1,2-Dichlorobenzene	0.5475	Travis and Arms 1988	1.00	--
1,3-Dichlorobenzene	0.3673	Travis and Arms 1988	1.00	--
1,4-Dichlorobenzene	0.5055	Travis and Arms 1988	1.00	--
4-Bromophenyl-phenylether	0.0578	Travis and Arms 1988	1.00	--
4-Chlorophenyl-phenylether	0.1697	Travis and Arms 1988	1.00	--
Acenaphthene	0.2564	Travis and Arms 1988	0.30	Beyer and Stafford 1993
Acenaphthylene	0.1653	Travis and Arms 1988	0.22	Beyer and Stafford 1993
Anthracene	0.1051	Travis and Arms 1988	0.32	Beyer and Stafford 1993
Benzo(a)anthracene	0.0222	Travis and Arms 1988	0.27	Beyer and Stafford 1993
Benzo(a)pyrene	0.0135	Travis and Arms 1988	0.34	Beyer and Stafford 1993
Benzo(b)fluoranthene	0.0174	Travis and Arms 1988	0.21	Beyer and Stafford 1993
Benzo(g,h,i)perylene	0.0061	Travis and Arms 1988	0.15	Beyer and Stafford 1993
Benzo(k)fluoranthene	0.0112	Travis and Arms 1988	0.21	Beyer and Stafford 1993
Chrysene	0.0289	Travis and Arms 1988	0.44	Beyer and Stafford 1993
Dibenz(a,h)anthracene	0.0068	Travis and Arms 1988	0.49	Beyer and Stafford 1993
Fluoranthene	0.0617	Travis and Arms 1988	0.37	Beyer and Stafford 1993
Fluorene	0.1790	Travis and Arms 1988	0.20	Beyer and Stafford 1993

Table 7-10
Soil Bioconcentration Factors for Plants and Soil Invertebrates - Step 2
Site 28
IHDIV-NSWC

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)	
	Value	Reference	Value	Reference
Hexachlorobenzene	0.0367	Travis and Arms 1988	1.69	Beyer 1996
Hexachlorobutadiene	0.0705	Travis and Arms 1988	1.00	--
Hexachlorocyclopentadiene	0.0467	Travis and Arms 1988	1.00	--
Hexachloroethane	0.2399	Travis and Arms 1988	1.00	--
Indeno(1,2,3-cd)pyrene	0.0061	Travis and Arms 1988	0.41	Beyer and Stafford 1993
Pentachlorophenol	0.0492	Travis and Arms 1988	8.00	van Gestel and Ma 1988
Phenanthrene	0.1154	Travis and Arms 1988	0.28	Beyer and Stafford 1993
Pyrene	0.0687	Travis and Arms 1988	0.39	Beyer and Stafford 1993
Volatile Organics				
1,1,2,2-Tetrachloroethane	1.7899	Travis and Arms 1988	1.00	--

Table 7-11
Bioaccumulative Chemicals List and Log K_{ow} Values
Site 28
IHDIV-NSWC

Chemical	Log K_{ow} Range	Selected log K_{ow}	Reference
Semivolatile Organics			
1,2,4-Trichlorobenzene	3.89 to 4.23	4.01	USEPA 1995
1,2-Dichlorobenzene	3.20 to 3.61	3.43	USEPA 1995
1,3-Dichlorobenzene	Not reported	3.50	USEPA 1996
1,4-Dichlorobenzene	3.26 to 3.78	3.42	USEPA 1995
4-Bromophenyl-Phenylether	4.89 to 5.24	5.00	USEPA 1995
4-Chloro-3-Methylphenol	Not reported	3.10	USEPA 1996
Acenaphthene	3.77 to 4.49	3.92	USEPA 1995
Acenaphthylene	Not reported	4.10	USEPA 1996
Anthracene	3.45 to 4.80	4.55	USEPA 1995
Benzo(a)anthracene	4.00 to 5.79	5.70	USEPA 1995
Benzo(a)pyrene	5.98 to 6.42	6.11	USEPA 1995
Benzo(b)fluoranthene	5.79 to 6.40	6.20	USEPA 1995
Benzo(g,h,i)perylene	6.63 to 7.05	6.70	USEPA 1995
Benzo(k)fluoranthene	6.12 to 6.27	6.20	USEPA 1995
Chrysene	5.41 to 5.79	5.70	USEPA 1995
Dibenz(a,h)anthracene	6.50 to 6.88	6.69	USEPA 1995
Fluoranthene	4.31 to 5.39	5.12	USEPA 1995
Fluorene	4.04 to 4.40	4.21	USEPA 1995
Hexachloro-1,3-butadiene	4.74 to 5.16	4.81	USEPA 1995
Hexachlorobenzene	5.00 to 7.42	5.89	USEPA 1995
Hexachlorocyclopentadiene	5.04 to 5.51	5.39	USEPA 1995
Hexachloroethane	3.82 to 4.14	4.00	USEPA 1995
Indeno(1,2,3-cd)pyrene	6.58 to 6.72	6.65	USEPA 1995
Pentachlorophenol	3.29 to 5.24	5.09	USEPA 1995
Phenanthrene	4.28 to 4.57	4.55	USEPA 1995
Pyrene	4.76 to 5.52	5.11	USEPA 1995

Table 7-12
Soil Bioaccumulation Factors for Small Mammals - Step 2
Site 28
INHDIV-NSWC

Chemical	Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference
Inorganics						
Arsenic	0.014	Sample et al. 1998b	0.016	Sample et al. 1998b	0.015	Sample et al. 1998b
Cadmium	0.462	Sample et al. 1998b	0.448	Sample et al. 1998b	7.017	Sample et al. 1998b
Chromium	0.349	Sample et al. 1998b	0.309	Sample et al. 1998b	0.333	Sample et al. 1998b
Copper	0.554	Sample et al. 1998b	1.290	Sample et al. 1998b	1.117	Sample et al. 1998b
Lead	0.286	Sample et al. 1998b	0.187	Sample et al. 1998b	0.339	Sample et al. 1998b
Mercury	0.130	Sample et al. 1998b	0.192	Sample et al. 1998b	0.192	Sample et al. 1998b
Nickel	0.589	Sample et al. 1998b	0.898	Sample et al. 1998b	0.578	Sample et al. 1998b
Selenium	1.263	Sample et al. 1998b	1.187	Sample et al. 1998b	1.187	Sample et al. 1998b
Silver	0.810	Sample et al. 1998b	0.007	Sample et al. 1998b	0.501	Sample et al. 1998b
Tin	--	see text	--	see text	--	see text
Zinc	2.782	Sample et al. 1998b	2.317	Sample et al. 1998b	2.901	Sample et al. 1998b
Semivolatile Organics						
1,2,4-Trichlorobenzene	--	see text	--	see text	--	see text
1,2-Dichlorobenzene	--	see text	--	see text	--	see text
1,3-Dichlorobenzene	--	see text	--	see text	--	see text
1,4-Dichlorobenzene	--	see text	--	see text	--	see text
4-Bromophenyl-phenylether	--	see text	--	see text	--	see text
4-Chlorophenyl-phenylether	--	see text	--	see text	--	see text
Acenaphthene	--	see text	--	see text	--	see text
Acenaphthylene	--	see text	--	see text	--	see text
Anthracene	--	see text	--	see text	--	see text
Benzo(a)anthracene	--	see text	--	see text	--	see text
Benzo(a)pyrene	--	see text	--	see text	--	see text
Benzo(b)fluoranthene	--	see text	--	see text	--	see text
Benzo(g,h,i)perylene	--	see text	--	see text	--	see text
Benzo(k)fluoranthene	--	see text	--	see text	--	see text
Chrysene	--	see text	--	see text	--	see text
Dibenz(a,h)anthracene	--	see text	--	see text	--	see text
Fluoranthene	--	see text	--	see text	--	see text
Fluorene	--	see text	--	see text	--	see text

Table 7-12
Soil Bioaccumulation Factors for Small Mammals - Step 2
Site 28
INHDIV-NSWC

Chemical	Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference
Hexachlorobenzene	--	see text	--	see text	--	see text
Hexachlorobutadiene	--	see text	--	see text	--	see text
Hexachlorocyclopentadiene	--	see text	--	see text	--	see text
Hexachloroethane	--	see text	--	see text	--	see text
Indeno(1,2,3-cd)pyrene	--	see text	--	see text	--	see text
Pentachlorophenol	--	see text	--	see text	--	see text
Phenanthrene	--	see text	--	see text	--	see text
Pyrene	--	see text	--	see text	--	see text
Volatile Organics						
1,1,2,2-Tetrachloroethane	--	see text	--	see text	--	see text

Table 7-13
Sediment Bioaccumulation Factors for Aquatic Plants and Frogs - Step 2
Site 28
IHDIV-NSWC

Chemical	Sediment-Plant BCF (dry weight)		Sediment-Frog BAF (dry weight)	
	Value	Reference	Value	Reference
Inorganics				
Arsenic	1.103	Bechtel Jacobs 1998a	0.126	Pascoe et al. 1996
Cadmium	3.250	Bechtel Jacobs 1998a	0.164	Pascoe et al. 1996
Chromium	0.084	Bechtel Jacobs 1998a	0.038	Krantzberg and Boyd 1992
Copper	0.625	Bechtel Jacobs 1998a	0.100	Krantzberg and Boyd 1992
Lead	0.468	Bechtel Jacobs 1998a	0.070	Krantzberg and Boyd 1992
Mercury	5.000	Bechtel Jacobs 1998a	4.580	Cope et al. 1990
Nickel	1.411	Bechtel Jacobs 1998a	1.000	--
Selenium	3.012	Bechtel Jacobs 1998a	1.000	--
Silver	0.037	Bechtel Jacobs 1998a	1.000	--
Tin	0.030	Baes et al. 1984	1.000	--
Zinc	1.820	Bechtel Jacobs 1998a	0.147	Pascoe et al. 1996
Semivolatile Organics				
1,2,4-Trichlorobenzene	0.2186	Travis and Arms 1988	0.074	Parkerton et al. 1993
1,2-Dichlorobenzene	0.5475	Travis and Arms 1988	0.085	Parkerton et al. 1993
1,3-Dichlorobenzene	0.3673	Travis and Arms 1988	0.085	Parkerton et al. 1993
1,4-Dichlorobenzene	0.5055	Travis and Arms 1988	0.085	Parkerton et al. 1993
4-Bromophenyl-phenylether	0.0578	Travis and Arms 1988	1.000	--
4-Chlorophenyl-phenylether	0.1697	Travis and Arms 1988	1.000	--
Acenaphthene	0.2564	Travis and Arms 1988	1.000	--
Acenaphthylene	0.1653	Travis and Arms 1988	1.000	--
Anthracene	0.1051	Travis and Arms 1988	1.000	--
Benzo(a)anthracene	0.0222	Travis and Arms 1988	1.000	--
Benzo(a)pyrene	0.0135	Travis and Arms 1988	1.000	--
Benzo(b)fluoranthene	0.0174	Travis and Arms 1988	1.000	--
Benzo(g,h,i)perylene	0.0061	Travis and Arms 1988	1.000	--
Benzo(k)fluoranthene	0.0112	Travis and Arms 1988	1.000	--
Chrysene	0.0289	Travis and Arms 1988	1.000	--
Dibenz(a,h)anthracene	0.0068	Travis and Arms 1988	1.000	--
Fluoranthene	0.0617	Travis and Arms 1988	1.000	--
Fluorene	0.1790	Travis and Arms 1988	1.000	--

Table 7-13
Sediment Bioaccumulation Factors for Aquatic Plants and Frogs - Step 2
Site 28
IHDIV-NSWC

Chemical	Sediment-Plant BCF (dry weight)		Sediment-Frog BAF (dry weight)	
	Value	Reference	Value	Reference
Hexachlorobenzene	0.0367	Travis and Arms 1988	0.940	Oliver and Niimi 1988
Hexachlorobutadiene	0.0705	Travis and Arms 1988	0.384	Parkerton et al. 1993
Hexachlorocyclopentadiene	0.0467	Travis and Arms 1988	1.000	--
Hexachloroethane	0.2399	Travis and Arms 1988	1.000	--
Indeno(1,2,3-cd)pyrene	0.0061	Travis and Arms 1988	1.000	--
Pentachlorophenol	0.0492	Travis and Arms 1988	1.000	--
Phenanthrene	0.1154	Travis and Arms 1988	1.000	--
Pyrene	0.0687	Travis and Arms 1988	1.000	--
Volatile Organics				
1,1,2,2-Tetrachloroethane	1.7899	Travis and Arms 1988	1.000	--

Table 7-14
Sediment Bioaccumulation Factors for Benthic Invertebrates and Fish - Step 2
Site 28
IHDIV-NSWC

Chemical	Sediment-Invertebrate BAF (dry weight)		Sediment-Fish BAF (dry weight)	
	Value	Reference	Value	Reference
Inorganics				
Arsenic	0.690	Bechtel Jacobs 1998b	0.126	Pascoe et al. 1996
Cadmium	3.073	Bechtel Jacobs 1998b	0.164	Pascoe et al. 1996
Chromium	0.186	Bechtel Jacobs 1998b	0.038	Krantzberg and Boyd 1992
Copper	7.957	Bechtel Jacobs 1998b	0.100	Krantzberg and Boyd 1992
Lead	0.326	Bechtel Jacobs 1998b	0.070	Krantzberg and Boyd 1992
Mercury	2.868	Bechtel Jacobs 1998b	4.580	Cope et al. 1990
Nickel	0.214	Bechtel Jacobs 1998b	1.000	--
Selenium	1.000	--	1.000	--
Silver	0.180	Hirsch 1998	1.000	--
Tin	1.000	--	1.000	--
Zinc	4.759	Bechtel Jacobs 1998b	0.147	Pascoe et al. 1996
Semivolatile Organics				
1,2,4-Trichlorobenzene	0.480	Oliver and Niimi 1988	0.074	Parkerton et al. 1993
1,2-Dichlorobenzene	1.000	--	0.085	Parkerton et al. 1993
1,3-Dichlorobenzene	1.000	--	0.085	Parkerton et al. 1993
1,4-Dichlorobenzene	1.000	--	0.085	Parkerton et al. 1993
4-Bromophenyl-phenylether	1.000	--	1.000	--
4-Chlorophenyl-phenylether	1.000	--	1.000	--
Acenaphthene	2.040	Maruya et al. 1997	1.000	--
Acenaphthylene	2.040	Acenaphthene value	1.000	--
Anthracene	0.271	Maruya et al. 1997	1.000	--
Benzo(a)anthracene	1.400	Maruya et al. 1997	1.000	--
Benzo(a)pyrene	0.191	Maruya et al. 1997	1.000	--
Benzo(b)fluoranthene	0.160	Maruya et al. 1997	1.000	--
Benzo(g,h,i)perylene	0.295	Maruya et al. 1997	1.000	--
Benzo(k)fluoranthene	0.421	Maruya et al. 1997	1.000	--
Chrysene	0.335	Maruya et al. 1997	1.000	--
Dibenz(a,h)anthracene	0.271	Anthracene value	1.000	--
Fluoranthene	0.312	Maruya et al. 1997	1.000	--
Fluorene	1.130	Maruya et al. 1997	1.000	--

Table 7-14
Sediment Bioaccumulation Factors for Benthic Invertebrates and Fish - Step 2
Site 28
IHDIV-NSWC

Chemical	Sediment-Invertebrate BAF (dry weight)		Sediment-Fish BAF (dry weight)	
	Value	Reference	Value	Reference
Hexachlorobenzene	0.860	Oliver and Niimi 1988	0.940	Oliver and Niimi 1988
Hexachlorobutadiene	0.610	Oliver and Niimi 1988	0.384	Parkerton et al. 1993
Hexachlorocyclopentadiene	1.000	--	1.000	--
Hexachloroethane	1.000	--	1.000	--
Indeno(1,2,3-cd)pyrene	0.355	Maruya et al. 1997	1.000	--
Pentachlorophenol	1.000	--	1.000	--
Phenanthrene	0.652	Maruya et al. 1997	1.000	--
Pyrene	0.803	Maruya et al. 1997	1.000	--
Volatile Organics				
1,1,2,2-Tetrachloroethane	1.000	--	1.000	--

Table 7-15
Exposure Parameters for Upper Trophic Level Ecological Receptors - Step 2
Site 28
IHDIV-NSWC

Receptor	Body Weight (kg)		Water Ingestion Rate (L/day)		Food Ingestion Rate (kg/day - dry)	
	Value	Reference	Value	Reference	Value	Reference
Birds						
American robin	0.064	USEPA 1993	0.0129	allometric equation	0.0074	Levey and Karasov 1989
Great blue heron	2.10	Butler 1992	0.1090	allometric equation	0.4389	allometric equation
Eastern screech-owl	0.145	Dunning 1993	0.0216	allometric equation	0.0219	allometric equation
Mallard	0.612	Bellrose 1980	0.0850	allometric equation	0.0830	allometric equation
Mourning dove	0.105	Tomlinson et al. 1994	0.0175	allometric equation	0.0179	allometric equation
Tree swallow	0.016	Dunning 1993	0.0050	allometric equation	0.0012	Sample et al. 1997
Mammals						
Gray fox	3.34	Silva and Downing 1995	0.4464	allometric equation	0.2718	allometric equation
Meadow vole	0.030	Silva and Downing 1995	0.0133	USEPA 1993a	0.0031	USEPA 1993a
Mink	0.726	Silva and Downing 1995	0.0286	USEPA 1993a	0.0345	USEPA 1993a
Muskrat	0.750	USEPA 1993	0.1426	allometric equation	0.0765	USEPA 1993a
Short-tailed shrew	0.013	USEPA 1993	0.0048	USEPA 1993a	0.0019	USEPA 1993a

Table 7-15
Exposure Parameters for Upper Trophic Level Ecological Receptors - Step 2
Site 28
IHDIV-NSWC

Receptor	Dietary Composition (percent)							Soil/ Sediment Ingestion (percent)	
	Terr. Plants	Soil Invert.	Small Mammals	Fish/ Frogs	Aquatic Plants	Benthic Invert.	Reference	Value	Reference
Birds									
American robin	51.9	43.5	0	0	0	0	Martin et al. 1951	4.6	Sample and Suter 1994
Great blue heron	0	0	0	100	0	0	USEPA 1993a; Quinney and Smith 1980	0	Sample and Suter 1994
Eastern screech-owl	0	28.0	70.0	0	0	0	Johnsgard 19??	2.0	Assumed based on diet
Mallard	0	0	0	0	86.7	10.0	Palmer 1976	3.3	Beyer et al. 1994
Mourning dove	95.0	0	0	0	0	0	Tomlinson et al. 1994	5.0	Assumed based on diet
Tree swallow	17.0	18.0	0	0	0	65	Sample et al. 1997	0	Sample et al. 1997
Mammals									
Gray fox	32.0	6.0	59.2	0	0	0	NISC 1996	2.8	Beyer et al. 1994 (red fox)
Meadow vole	95.6	2	0	0	0	0	USEPA 1993a	2.4	Beyer et al. 1994
Mink	0	0	0	94.0	1.0	5.0	USEPA 1993a	0	Sample and Suter 1994
Muskrat	0	0	0	0	90.6	0	USEPA 1993a	9.4	Beyer et al. 1994 (raccoon)
Short-tailed shrew	4.7	82.3	0	0	0	0	USEPA 1993a; Sample and Suter 1994	13.0	Sample and Suter 1994

Table 7-16
Surface Soil Screening - Step 2
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Inorganics (MG/KG)								
Aluminum	28.0 - 98.0	35 / 35	13,100	IS28SS22-0001	1.00	35 / 35	13,100	YES
Antimony	8.40 - 29.0	6 / 19	18.3	IS28SS19-0001	0.48	6 / 19	38.1	YES
Arsenic	1.40 - 4.90	35 / 35	377	IS28SS04-0001	328	1 / 35	1.15	YES
Barium	28.0 - 98.0	35 / 35	1,550	IS28SS19-0001	440	3 / 35	3.52	YES
Beryllium	0.70 - 2.40	3 / 35	2.00	IS28SS22-0001	0.020	3 / 35	100	YES
Cadmium	0.70 - 2.40	25 / 35	141	IS28SS19-0001	2.50	19 / 35	56.4	YES
Chromium	1.40 - 4.90	35 / 35	169	IS28SS19-0001	0.0075	35 / 35	22,533	YES
Cobalt	7.00 - 24.0	35 / 35	13.2	IS28SS41-0001	100	0 / 35	0.13	NO
Copper	3.50 - 12.0	35 / 35	1,270	IS28SS19-0001	15.0	24 / 35	84.7	YES
Iron	14.0 - 49.0	35 / 35	84,600	IS28SS10-0001	12.0	35 / 35	7,050	YES
Lead	0.43 - 31.0	35 / 35	10,300	IS28SS19-0001	0.010	35 / 35	1,030,000	YES
Manganese	2.10 - 7.30	35 / 35	711	IS28SS10-0001	330	9 / 35	2.15	YES
Mercury	0.077 - 0.42	16 / 35	11.5	IS28SS15-0001	0.058	16 / 35	198	YES
Nickel	5.60 - 20.0	26 / 35	44.1	IS28SS19-0001	2.00	26 / 35	22.1	YES
Selenium	0.70 - 2.40	10 / 35	1.30	IS28SS10-0001	1.80	0 / 35	0.72	NO
Silver	1.40 - 4.90	10 / 35	16.1	IS28SS10-0001	9.80E-06	10 / 35	1,642,857	YES
Thallium	1.40 - 4.90	0 / 35	--	--	0.0010	-- / --	4,900	YES
Vanadium	7.00 - 24.0	35 / 35	70.4	IS28SS10-0001	0.50	35 / 35	141	YES
Zinc	2.90 - 390	35 / 35	71,900	IS28SS08-0001	10.0	35 / 35	7,190	YES
Semivolatile Organic Compounds (UG/KG)								
1,1-Biphenyl	370 - 2,400	1 / 35	120	IS28SS36-0001	600	0 / 35	0.20	NO
2,4,5-Trichlorophenol	930 - 6,000	1 / 35	130	IS28SS36-0001	100	1 / 35	1.30	YES
2,4,6-Trichlorophenol	370 - 2,400	1 / 35	100	IS28SS36-0001	100	1 / 35	1.00	YES
2,4-Dichlorophenol	370 - 2,400	1 / 35	100	IS28SS36-0001	100	1 / 35	1.00	YES
2,4-Dimethylphenol	370 - 2,400	1 / 35	77.0	IS28SS36-0001	100	0 / 35	0.77	NO
2,4-Dinitrophenol	930 - 6,000	0 / 35	--	--	100	-- / --	60.0	YES
2,4-Dinitrotoluene	370 - 2,400	3 / 35	1,200	IS28SS10-0001	NSV	-- / --	NSV	YES
2,6-Dinitrotoluene	370 - 2,400	1 / 35	110	IS28SS36-0001	NSV	-- / --	NSV	YES

NSV - No Screening Value
1 - Shaded cells: HQ based on reporting limits; '--' indicates chemical was not detected and reporting limits were not available

Table 7-16
Surface Soil Screening - Step 2
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
2-Chloronaphthalene	370 - 2,400	1 / 35	110	IS28SS36-0001	NSV	-- / --	NSV	YES
2-Chlorophenol	370 - 2,400	1 / 35	100	IS28SS36-0001	100	1 / 35	1.00	YES
2-Methylnaphthalene	370 - 2,400	1 / 35	150	IS28SS36-0001	NSV	-- / --	NSV	YES
2-Methylphenol	370 - 2,400	1 / 35	86.0	IS28SS36-0001	100	0 / 35	0.86	NO
2-Nitroaniline	930 - 6,000	1 / 35	64.0	IS28SS36-0001	NSV	-- / --	NSV	YES
2-Nitrophenol	370 - 2,400	1 / 35	100	IS28SS36-0001	NSV	-- / --	NSV	YES
3,3'-Dichlorobenzidine	370 - 2,400	0 / 35	--	--	NSV	-- / --	NSV	NO
3-Nitroaniline	930 - 6,000	0 / 35	--	--	NSV	-- / --	NSV	NO
4,6-Dinitro-2-methylphenol	930 - 6,000	1 / 35	98.0	IS28SS36-0001	NSV	-- / --	NSV	YES
4-Bromophenyl-phenylether	370 - 2,400	1 / 35	120	IS28SS36-0001	NSV	-- / --	NSV	YES
4-Chloro-3-methylphenol	370 - 2,400	1 / 35	82.0	IS28SS36-0001	NSV	-- / --	NSV	YES
4-Chloroaniline	370 - 2,400	0 / 35	--	--	NSV	-- / --	NSV	NO
4-Chlorophenyl-phenylether	370 - 2,400	1 / 35	120	IS28SS36-0001	NSV	-- / --	NSV	YES
4-Methylphenol	370 - 2,400	1 / 35	80.0	IS28SS36-0001	100	0 / 35	0.80	NO
4-Nitroaniline	930 - 6,000	0 / 35	--	--	NSV	-- / --	NSV	NO
4-Nitrophenol	930 - 6,000	0 / 35	--	--	100	-- / --	60.0	YES
Acenaphthene	370 - 2,400	2 / 35	130	IS28SS36-0001	100	1 / 35	1.30	YES
Acenaphthylene	370 - 2,400	4 / 35	120	IS28SS36-0001	100	1 / 35	1.20	YES
Acetophenone	370 - 2,400	1 / 35	100	IS28SS36-0001	NSV	-- / --	NSV	YES
Anthracene	370 - 2,400	4 / 35	120	IS28SS36-0001	100	1 / 35	1.20	YES
Atrazine	370 - 2,400	1 / 35	100	IS28SS36-0001	NSV	-- / --	NSV	YES
Benzaldehyde	370 - 2,400	1 / 35	150	IS28SS36-0001	NSV	-- / --	NSV	YES
Benzo(a)anthracene	370 - 2,400	20 / 35	540	IS28SS15-0001	100	10 / 35	5.40	YES
Benzo(a)pyrene	370 - 2,400	18 / 35	810	IS28SS15-0001	100	10 / 35	8.10	YES
Benzo(b)fluoranthene	370 - 2,400	23 / 35	1,700	IS28SS15-0001	100	11 / 35	17.0	YES
Benzo(g,h,i)perylene	370 - 2,400	9 / 35	540	IS28SS42-0001	100	4 / 35	5.40	YES
Benzo(k)fluoranthene	370 - 2,400	16 / 35	660	IS28SS15-0001	100	6 / 35	6.60	YES
Bis(2-chloro-1-methylethyl) ether	370 - 2,400	1 / 35	100	IS28SS36-0001	NSV	-- / --	NSV	YES
Butylbenzylphthalate	370 - 2,400	5 / 35	340	IS28SS06-0001	NSV	-- / --	NSV	YES

NSV - No Screening Value
1 - Shaded cells: HQ based on reporting limits; '--' indicates chemical was not detected and reporting limits were not available

Table 7-16
Surface Soil Screening - Step 2
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Caprolactam	370 - 2,400	1 / 35	86.0	IS28SS36-0001	NSV	-- / --	NSV	**YES**
Carbazole	370 - 2,400	3 / 35	140	IS28SS36-0001	NSV	-- / --	NSV	**YES**
Chrysene	370 - 2,400	22 / 35	620	IS28SS15-0001	100	10 / 35	6.20	**YES**
Di-n-butylphthalate	370 - 2,400	7 / 35	550	IS28SS20-0001	200,000	0 / 35	0.0028	NO
Di-n-octylphthalate	370 - 2,400	1 / 35	120	IS28SS36-0001	NSV	-- / --	NSV	**YES**
Dibenz(a,h)anthracene	370 - 2,400	8 / 35	500	IS28SS42-0001	100	3 / 35	5.00	**YES**
Dibenzofuran	370 - 2,400	2 / 35	120	IS28SS36-0001	NSV	-- / --	NSV	**YES**
Diethylphthalate	370 - 2,400	6 / 35	160	IS28SS19-0001	1,000	0 / 35	0.16	NO
Dimethyl phthalate	370 - 2,400	1 / 35	110	IS28SS36-0001	2,000	0 / 35	0.055	NO
Fluoranthene	370 - 2,400	26 / 35	850	IS28SS17-0001	100	13 / 35	8.50	**YES**
Fluorene	370 - 2,400	1 / 35	120	IS28SS36-0001	100	1 / 35	1.20	**YES**
Hexachlorobenzene	370 - 2,400	1 / 35	130	IS28SS36-0001	1,000,000	0 / 35	1.30E-04	NO
Hexachlorobutadiene	370 - 2,400	1 / 35	120	IS28SS36-0001	NSV	-- / --	NSV	**YES**
Hexachlorocyclopentadiene	370 - 2,400	1 / 35	79.0	IS28SS36-0001	100	0 / 35	0.79	NO
Hexachloroethane	370 - 2,400	1 / 35	95.0	IS28SS36-0001	NSV	-- / --	NSV	**YES**
Indeno(1,2,3-cd)pyrene	370 - 2,400	17 / 35	1,100	IS28SS15-0001	100	8 / 35	11.0	**YES**
Isophorone	370 - 2,400	1 / 35	110	IS28SS36-0001	NSV	-- / --	NSV	**YES**
Naphthalene	370 - 2,400	1 / 35	110	IS28SS36-0001	100	1 / 35	1.10	**YES**
Nitrobenzene	370 - 2,400	1 / 35	120	IS28SS36-0001	400	0 / 35	0.30	NO
Pentachlorophenol	930 - 6,000	1 / 35	130	IS28SS36-0001	100	1 / 35	1.30	**YES**
Phenanthrene	370 - 2,400	16 / 35	740	IS28SS17-0001	100	4 / 35	7.40	**YES**
Phenol	370 - 2,400	1 / 35	100	IS28SS36-0001	100	1 / 35	1.00	**YES**
Pyrene	370 - 2,400	26 / 35	550	IS28SS17-0001	100	12 / 35	5.50	**YES**
bis(2-Chloroethoxy)methane	370 - 2,400	1 / 35	110	IS28SS36-0001	NSV	-- / --	NSV	**YES**
bis(2-Chloroethyl)ether	370 - 2,400	1 / 35	110	IS28SS36-0001	NSV	-- / --	NSV	**YES**
bis(2-Ethylhexyl)phthalate	370 - 2,400	7 / 35	330	IS28SS21-0001	NSV	-- / --	NSV	**YES**
n-Nitroso-di-n-propylamine	370 - 2,400	1 / 35	100	IS28SS36-0001	NSV	-- / --	NSV	**YES**
n-Nitrosodiphenylamine	370 - 2,400	10 / 35	12,000	IS28SS19-0001	20,000	0 / 35	0.6	NO
Explosives (UG/KG)								

NSV - No Screening Value
1 - Shaded cells: HQ based on reporting limits; '--' indicates chemical was not detected and reporting limits were not available

Table 7-16
Surface Soil Screening - Step 2
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
1,3,5-Trinitrobenzene	100 - 100	1 / 35	670	IS28SS11-0001	NSV	-- / --	NSV	**YES**
1,3-Dinitrobenzene	100 - 100	0 / 35	--	--	NSV	-- / --	NSV	NO
2,4,6-Trinitrotoluene	100 - 100	4 / 35	450	IS28SS24-0001	NSV	-- / --	NSV	**YES**
2,4-Dinitrotoluene	100 - 100	4 / 35	230	IS28SS24-0001	NSV	-- / --	NSV	**YES**
2,6-Dinitrotoluene	100 - 100	0 / 35	--	--	NSV	-- / --	NSV	NO
2-Amino-4,6-dinitrotoluene	100 - 100	0 / 35	--	--	NSV	-- / --	NSV	NO
2-Nitrotoluene	200 - 200	0 / 35	--	--	NSV	-- / --	NSV	NO
3-Nitrotoluene	200 - 200	0 / 35	--	--	NSV	-- / --	NSV	NO
4-Amino-2,6-dinitrotoluene	100 - 100	0 / 35	--	--	NSV	-- / --	NSV	NO
4-Nitrotoluene	200 - 200	0 / 35	--	--	NSV	-- / --	NSV	NO
HMX	200 - 200	1 / 35	230	IS28SS37-0001	NSV	-- / --	NSV	**YES**
Nitrobenzene	100 - 100	8 / 35	190	IS28SS42-0001	400	0 / 35	0.48	NO
Nitroglycerin	5,500 - 10,000	0 / 35	--	--	NSV	-- / --	NSV	NO
Nitroguanidine	130 - 130	0 / 35	--	--	NSV	-- / --	NSV	NO
PETN	500 - 500	0 / 35	--	--	NSV	-- / --	NSV	NO
Perchlorate	40.0 - 430	0 / 35	--	--	NSV	-- / --	NSV	NO
RDX	200 - 200	0 / 35	--	--	NSV	-- / --	NSV	NO
Tetryl	200 - 200	2 / 35	620	IS28SS24-0001	NSV	-- / --	NSV	**YES**
Volatile Organic Compounds (UG/KG)								
1,1,1-Trichloroethane	10.0 - 23.0	0 / 35	--	--	300	-- / --	0.077	NO
1,1,2,2-Tetrachloroethane	10.0 - 23.0	0 / 35	--	--	300	-- / --	0.077	NO
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10.0 - 23.0	0 / 35	--	--	NSV	-- / --	NSV	NO
1,1,2-Trichloroethane	10.0 - 23.0	0 / 35	--	--	300	-- / --	0.077	NO
1,1-Dichloroethane	10.0 - 23.0	0 / 35	--	--	300	-- / --	0.077	NO
1,1-Dichloroethene	10.0 - 23.0	0 / 35	--	--	NSV	-- / --	NSV	NO
1,2,4-Trichlorobenzene	10.0 - 23.0	0 / 35	--	--	100	-- / --	0.23	NO
1,2-Dibromo-3-chloropropane	10.0 - 23.0	0 / 35	--	--	NSV	-- / --	NSV	NO
1,2-Dibromoethane	10.0 - 23.0	0 / 35	--	--	5,000	-- / --	0.0046	NO
1,2-Dichlorobenzene	10.0 - 23.0	0 / 35	--	--	100	-- / --	0.23	NO

NSV - No Screening Value
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Table 7-16
Surface Soil Screening - Step 2
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
1,2-Dichloroethane	10.0 - 23.0	0 / 35	--	--	870,000	-- / --	2.64E-05	NO
1,2-Dichloroethene (total)	10.0 - 23.0	8 / 15	3.00	IS28SS33-0001	NSV	-- / --	NSV	YES
1,2-Dichloropropane	10.0 - 23.0	0 / 35	--	--	300	-- / --	0.077	NO
1,3-Dichlorobenzene	10.0 - 23.0	0 / 35	--	--	NSV	-- / --	NSV	NO
1,4-Dichlorobenzene	10.0 - 23.0	0 / 35	--	--	100	-- / --	0.23	NO
2-Butanone	10.0 - 23.0	0 / 35	--	--	NSV	-- / --	NSV	NO
2-Hexanone	10.0 - 23.0	0 / 35	--	--	NSV	-- / --	NSV	NO
4-Methyl-2-pentanone	10.0 - 23.0	0 / 35	--	--	100,000	-- / --	2.30E-04	NO
Acetone	10.0 - 23.0	0 / 35	--	--	NSV	-- / --	NSV	NO
Benzene	10.0 - 23.0	0 / 35	--	--	100	-- / --	0.23	NO
Bromodichloromethane	10.0 - 23.0	0 / 35	--	--	450,000	-- / --	5.11E-05	NO
Bromoform	10.0 - 23.0	0 / 35	--	--	1,147,000	-- / --	2.01E-05	NO
Bromomethane	10.0 - 23.0	0 / 35	--	--	NSV	-- / --	NSV	NO
Carbon disulfide	10.0 - 23.0	0 / 35	--	--	NSV	-- / --	NSV	NO
Carbon tetrachloride	10.0 - 23.0	0 / 35	--	--	300	-- / --	0.077	NO
Chlorobenzene	10.0 - 23.0	0 / 35	--	--	100	-- / --	0.23	NO
Chloroethane	10.0 - 23.0	0 / 35	--	--	NSV	-- / --	NSV	NO
Chloroform	10.0 - 23.0	0 / 35	--	--	300	-- / --	0.077	NO
Chloromethane	10.0 - 23.0	0 / 35	--	--	NSV	-- / --	NSV	NO
Cumene	10.0 - 23.0	1 / 35	7.00	IS28SS41-0001	NSV	-- / --	NSV	YES
Cyclohexane	10.0 - 23.0	0 / 35	--	--	100	-- / --	0.23	NO
Dibromochloromethane	10.0 - 23.0	0 / 35	--	--	NSV	-- / --	NSV	NO
Dichlorodifluoromethane(Freon-12)	10.0 - 23.0	0 / 35	--	--	NSV	-- / --	NSV	NO
Ethylbenzene	10.0 - 23.0	0 / 35	--	--	100	-- / --	0.23	NO
Methyl acetate	10.0 - 23.0	1 / 35	6.00	IS28SS37-0001	NSV	-- / --	NSV	YES
Methyl-tert-butyl ether (MTBE)	10.0 - 23.0	19 / 35	11.0	IS28SS33-0001	NSV	-- / --	NSV	YES
Methylcyclohexane	10.0 - 23.0	0 / 35	--	--	NSV	-- / --	NSV	NO
Methylene chloride	10.0 - 23.0	0 / 35	--	--	300	-- / --	0.077	NO
Styrene	10.0 - 23.0	1 / 35	9.00	IS28SS27-0001	100	0 / 35	0.090	NO

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Table 7-16
Surface Soil Screening - Step 2
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Tetrachloroethene	10.0 - 23.0	0 / 35	--	--	300	-- / --	0.077	NO
Toluene	10.0 - 23.0	0 / 35	--	--	100	-- / --	0.23	NO
Trichloroethene	10.0 - 23.0	0 / 35	--	--	300	-- / --	0.077	NO
Trichlorofluoromethane(Freon-11)	10.0 - 23.0	0 / 35	--	--	NSV	-- / --	NSV	NO
Vinyl chloride	10.0 - 23.0	0 / 35	--	--	300	-- / --	0.077	NO
Xylene, total	10.0 - 23.0	1 / 35	2.00	IS28SS21-0001	100	0 / 35	0.020	NO
cis-1,2-Dichloroethene	10.0 - 23.0	8 / 35	3.00	IS28SS33-0001	300	0 / 35	0.010	NO
cis-1,3-Dichloropropene	10.0 - 23.0	0 / 35	--	--	300	-- / --	0.077	NO
m- and p-Xylene	10.0 - 23.0	1 / 15	2.00	IS28SS21-0001	NSV	-- / --	NSV	**YES**
o-Xylene	10.0 - 23.0	0 / 15	--	--	NSV	-- / --	NSV	NO
trans-1,2-Dichloroethene	10.0 - 23.0	0 / 35	--	--	300	-- / --	0.077	NO
trans-1,3-Dichloropropene	10.0 - 23.0	0 / 35	--	--	300	-- / --	0.077	NO

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Table 7-17
Onsite Sediment Screening Statistics - Step 2
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Inorganics (MG/KG)								
Aluminum	44.0 - 99.0	8 / 8	13,400	IS28SD02-0503	25,500	0 / 8	0.53	NO
Antimony	13.0 - 30.0	1 / 8	0.40	IS28SD040006	150	0 / 8	0.0027	NO
Arsenic	2.20 - 5.00	7 / 8	220	IS28SD02-0503	8.20	7 / 8	26.8	**YES**
Barium	44.0 - 99.0	8 / 8	166	IS28SD02-0503	NSV	-- / --	NSV	**YES**
Beryllium	1.10 - 2.50	2 / 8	0.26	IS28SD020006	NSV	-- / --	NSV	**YES**
Cadmium	1.10 - 2.50	6 / 8	28.0	IS28SD02-0503	1.20	6 / 8	23.3	**YES**
Chromium	2.20 - 5.00	8 / 8	18.3	IS28SD02-0503	5.00	7 / 8	3.66	**YES**
Cobalt	11.0 - 25.0	8 / 8	11.7	IS28SD02-0503	NSV	-- / --	NSV	**YES**
Copper	5.40 - 12.0	7 / 8	111	IS28SD02-0503	34.0	6 / 8	3.26	**YES**
Iron	22.0 - 50.0	8 / 8	31,900	IS28SD02-0503	188,400	0 / 8	0.17	NO
Lead	0.66 - 15.0	8 / 8	827	IS28SD02-0503	46.7	6 / 8	17.7	**YES**
Manganese	3.30 - 7.40	8 / 8	351	IS28SD030006	1,673	0 / 8	0.21	NO
Mercury	0.085 - 0.35	2 / 8	0.48	IS28SD02-0503	0.15	2 / 8	3.20	**YES**
Nickel	8.70 - 20.0	8 / 8	44.4	IS28SD01-0503	20.9	1 / 8	2.12	**YES**
Selenium	1.10 - 2.50	5 / 8	2.00	IS28SD02-0503	NSV	-- / --	NSV	**YES**
Silver	2.20 - 5.00	2 / 8	1.10	IS28SD01-0503	1.00	2 / 8	1.10	**YES**
Thallium	2.20 - 5.00	0 / 8	--	--	NSV	-- / --	NSV	NO
Vanadium	11.0 - 25.0	7 / 8	39.3	IS28SD02-0503	NSV	-- / --	NSV	**YES**
Zinc	4.40 - 99.0	8 / 8	14,200	IS28SD02-0503	150	6 / 8	94.7	**YES**
Semivolatile Organic Compounds (UG/KG)								
1,1-Biphenyl	450 - 1,200	0 / 4	--	--	NSV	-- / --	NSV	NO
2,4,5-Trichlorophenol	1,100 - 3,200	0 / 4	--	--	NSV	-- / --	NSV	NO
2,4,6-Trichlorophenol	450 - 1,200	0 / 4	--	--	NSV	-- / --	NSV	NO
2,4-Dichlorophenol	450 - 1,200	0 / 4	--	--	NSV	-- / --	NSV	NO
2,4-Dimethylphenol	450 - 1,200	0 / 4	--	--	29.0	-- / --	41.4	**YES**
2,4-Dinitrophenol	1,100 - 3,200	0 / 4	--	--	NSV	-- / --	NSV	NO
2,4-Dinitrotoluene	450 - 1,200	1 / 4	820	IS28SD02-0503	NSV	-- / --	NSV	**YES**
2,6-Dinitrotoluene	450 - 1,200	0 / 4	--	--	NSV	-- / --	NSV	NO

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Table 7-17
Onsite Sediment Screening Statistics - Step 2
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
2-Chloronaphthalene	450 - 1,200	0 / 4	--	--	NSV	-- / --	NSV	NO
2-Chlorophenol	450 - 1,200	0 / 4	--	--	NSV	-- / --	NSV	NO
2-Methylnaphthalene	450 - 1,200	0 / 4	--	--	70.0	-- / --	17.1	YES
2-Methylphenol	450 - 1,200	0 / 4	--	--	63.0	-- / --	19.0	YES
2-Nitroaniline	1,100 - 3,200	0 / 4	--	--	NSV	-- / --	NSV	NO
2-Nitrophenol	450 - 1,200	0 / 4	--	--	NSV	-- / --	NSV	NO
3,3'-Dichlorobenzidine	450 - 1,200	0 / 4	--	--	NSV	-- / --	NSV	NO
3-Nitroaniline	1,100 - 3,200	0 / 4	--	--	NSV	-- / --	NSV	NO
4,6-Dinitro-2-methylphenol	1,100 - 3,200	0 / 4	--	--	NSV	-- / --	NSV	NO
4-Bromophenyl-phenylether	450 - 1,200	0 / 4	--	--	NSV	-- / --	NSV	NO
4-Chloro-3-methylphenol	450 - 1,200	0 / 4	--	--	NSV	-- / --	NSV	NO
4-Chloroaniline	450 - 1,200	0 / 4	--	--	NSV	-- / --	NSV	NO
4-Chlorophenyl-phenylether	450 - 1,200	0 / 4	--	--	NSV	-- / --	NSV	NO
4-Methylphenol	450 - 1,200	0 / 4	--	--	670	-- / --	1.79	YES
4-Nitroaniline	1,100 - 3,200	0 / 4	--	--	NSV	-- / --	NSV	NO
4-Nitrophenol	1,100 - 3,200	0 / 4	--	--	NSV	-- / --	NSV	NO
Acenaphthene	450 - 1,200	0 / 4	--	--	16.0	-- / --	75.0	YES
Acenaphthylene	450 - 1,200	0 / 4	--	--	44.0	-- / --	27.3	YES
Acetophenone	450 - 1,200	0 / 4	--	--	NSV	-- / --	NSV	NO
Anthracene	450 - 1,200	0 / 4	--	--	85.3	-- / --	14.1	YES
Atrazine	450 - 1,200	0 / 4	--	--	NSV	-- / --	NSV	NO
Benzaldehyde	450 - 1,200	0 / 4	--	--	NSV	-- / --	NSV	NO
Benzo(a)anthracene	450 - 1,200	2 / 4	140	IS28SD02-0503	261	0 / 4	0.54	NO
Benzo(a)pyrene	450 - 1,200	2 / 4	130	IS28SD02-0503	430	0 / 4	0.30	NO
Benzo(b)fluoranthene	450 - 1,200	3 / 4	250	IS28SD02-0503	3,200	0 / 4	0.078	NO
Benzo(g,h,i)perylene	450 - 1,200	1 / 4	36.0	IS28SD03-0503	670	0 / 4	0.054	NO
Benzo(k)fluoranthene	450 - 1,200	1 / 4	71.0	IS28SD03-0503	240	0 / 4	0.30	NO
Bis(2-chloro-1-methylethyl) ether	450 - 1,200	0 / 4	--	--	NSV	-- / --	NSV	NO
Butylbenzylphthalate	450 - 1,200	1 / 4	28.0	IS28SD020006	63.0	0 / 4	0.44	NO

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Table 7-17
Onsite Sediment Screening Statistics - Step 2
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Caprolactam	450 - 1,200	0 / 4	--	--	NSV	-- / --	NSV	NO
Carbazole	450 - 1,200	0 / 4	--	--	NSV	-- / --	NSV	NO
Chrysene	450 - 1,200	3 / 4	160	IS28SD02-0503	384	0 / 4	0.42	NO
Di-n-butylphthalate	450 - 1,200	3 / 4	110	IS28SD02-0503	1,400	0 / 4	0.079	NO
Di-n-octylphthalate	450 - 1,200	0 / 4	--	--	6,200	-- / --	0.19	NO
Dibenz(a,h)anthracene	450 - 1,200	0 / 4	--	--	63.4	-- / --	18.9	YES
Dibenzofuran	450 - 1,200	0 / 4	--	--	540	-- / --	2.22	YES
Diethylphthalate	450 - 1,200	0 / 4	--	--	200	-- / --	6.00	YES
Dimethyl phthalate	450 - 1,200	0 / 4	--	--	71.0	-- / --	16.9	YES
Fluoranthene	450 - 1,200	3 / 4	220	IS28SD02-0503	600	0 / 4	0.37	NO
Fluorene	450 - 1,200	0 / 4	--	--	19.0	-- / --	63.2	YES
Hexachlorobenzene	450 - 1,200	0 / 4	--	--	22.0	-- / --	54.5	YES
Hexachlorobutadiene	450 - 1,200	0 / 4	--	--	11.0	-- / --	109	YES
Hexachlorocyclopentadiene	450 - 1,200	0 / 4	--	--	NSV	-- / --	NSV	NO
Hexachloroethane	450 - 1,200	0 / 4	--	--	NSV	-- / --	NSV	NO
Indeno(1,2,3-cd)pyrene	450 - 1,200	2 / 4	93.0	IS28SD02-0503	600	0 / 4	0.16	NO
Isophorone	450 - 1,200	0 / 4	--	--	NSV	-- / --	NSV	NO
Naphthalene	450 - 1,200	0 / 4	--	--	160	-- / --	7.50	YES
Nitrobenzene	450 - 1,200	0 / 4	--	--	NSV	-- / --	NSV	NO
Pentachlorophenol	1,100 - 3,200	0 / 4	--	--	360	-- / --	8.89	YES
Phenanthrene	450 - 1,200	1 / 4	72.0	IS28SD02-0503	240	0 / 4	0.30	NO
Phenol	450 - 1,200	0 / 4	--	--	420	-- / --	2.86	YES
Pyrene	450 - 1,200	3 / 4	230	IS28SD02-0503	665	0 / 4	0.35	NO
bis(2-Chloroethoxy)methane	450 - 1,200	0 / 4	--	--	NSV	-- / --	NSV	NO
bis(2-Chloroethyl)ether	450 - 1,200	0 / 4	--	--	NSV	-- / --	NSV	NO
bis(2-Ethylhexyl)phthalate	450 - 1,200	0 / 4	--	--	1,300	-- / --	0.92	NO
n-Nitroso-di-n-propylamine	450 - 1,200	0 / 4	--	--	NSV	-- / --	NSV	NO
n-Nitrosodiphenylamine	450 - 1,200	1 / 4	220	IS28SD02-0503	28.0	1 / 4	7.86	YES
Explosives (UG/KG)								

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Table 7-17
Onsite Sediment Screening Statistics - Step 2
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
1,3,5-Trinitrobenzene	100 - 100	0 / 4	--	--	NSV	-- / --	NSV	NO
1,3-Dinitrobenzene	100 - 100	0 / 4	--	--	NSV	-- / --	NSV	NO
2,4,6-Trinitrotoluene	100 - 100	0 / 4	--	--	NSV	-- / --	NSV	NO
2,4-Dinitrotoluene	100 - 100	1 / 4	130	IS28SD02-0503	NSV	-- / --	NSV	**YES**
2,6-Dinitrotoluene	100 - 100	0 / 4	--	--	NSV	-- / --	NSV	NO
2-Amino-4,6-dinitrotoluene	100 - 100	1 / 4	59.0	IS28SD02-0503	NSV	-- / --	NSV	**YES**
2-Nitrotoluene	200 - 200	0 / 4	--	--	NSV	-- / --	NSV	NO
3-Nitrotoluene	200 - 200	0 / 4	--	--	NSV	-- / --	NSV	NO
4-Amino-2,6-dinitrotoluene	100 - 100	1 / 4	110	IS28SD02-0503	NSV	-- / --	NSV	**YES**
4-Nitrotoluene	200 - 200	0 / 4	--	--	NSV	-- / --	NSV	NO
HMX	200 - 200	0 / 4	--	--	NSV	-- / --	NSV	NO
Nitrobenzene	100 - 100	0 / 4	--	--	NSV	-- / --	NSV	NO
Nitroglycerin	6,000 - 13,000	1 / 4	25,000	IS28SD02-0503	NSV	-- / --	NSV	**YES**
Nitroguanidine	130 - 130	0 / 4	--	--	NSV	-- / --	NSV	NO
PETN	500 - 500	0 / 4	--	--	NSV	-- / --	NSV	NO
Perchlorate	40.0 - 49.0	0 / 4	--	--	NSV	-- / --	NSV	NO
RDX	200 - 200	0 / 4	--	--	NSV	-- / --	NSV	NO
Tetryl	200 - 200	0 / 4	--	--	NSV	-- / --	NSV	NO
Volatile Organic Compounds (UG/KG)								
1,1,1-Trichloroethane	13.0 - 34.0	0 / 3	--	--	31.0	-- / --	1.10	**YES**
1,1,2,2-Tetrachloroethane	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
1,1,2-Trichloroethane	13.0 - 34.0	0 / 3	--	--	31.0	-- / --	1.10	**YES**
1,1-Dichloroethane	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
1,1-Dichloroethene	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
1,2,4-Trichlorobenzene	13.0 - 34.0	0 / 3	--	--	40.0	-- / --	0.85	NO
1,2-Dibromo-3-chloropropane	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
1,2-Dibromoethane	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
1,2-Dichlorobenzene	13.0 - 34.0	0 / 3	--	--	35.0	-- / --	0.97	NO

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Table 7-17
Onsite Sediment Screening Statistics - Step 2
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
1,2-Dichloroethane	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
1,2-Dichloroethene (total)	13.0 - 34.0	2 / 3	3.00	IS28SD02-0503	NSV	-- / --	NSV	**YES**
1,2-Dichloropropane	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
1,3-Dichlorobenzene	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
1,4-Dichlorobenzene	13.0 - 34.0	0 / 3	--	--	110	-- / --	0.31	NO
2-Butanone	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
2-Hexanone	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
4-Methyl-2-pentanone	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Acetone	13.0 - 34.0	1 / 3	3.00	IS28SD03-0503	NSV	-- / --	NSV	**YES**
Benzene	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Bromodichloromethane	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Bromoform	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Bromomethane	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Carbon disulfide	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Carbon tetrachloride	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Chlorobenzene	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Chloroethane	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Chloroform	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Chloromethane	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Cumene	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Cyclohexane	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Dibromochloromethane	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Dichlorodifluoromethane(Freon-12)	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Ethylbenzene	13.0 - 34.0	0 / 3	--	--	10.0	-- / --	3.40	**YES**
Methyl acetate	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Methyl-tert-butyl ether (MTBE)	13.0 - 34.0	1 / 3	5.00	IS28SD03-0503	NSV	-- / --	NSV	**YES**
Methylcyclohexane	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Methylene chloride	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Styrene	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO

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Table 7-17
Onsite Sediment Screening Statistics - Step 2
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Tetrachloroethene	13.0 - 34.0	0 / 3	--	--	57.0	-- / --	0.60	NO
Toluene	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Trichloroethene	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Trichlorofluoromethane(Freon-11)	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Vinyl chloride	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Xylene, total	13.0 - 34.0	0 / 3	--	--	40.0	-- / --	0.85	NO
cis-1,2-Dichloroethene	13.0 - 34.0	3 / 3	3.00	IS28SD02-0503	NSV	-- / --	NSV	**YES**
cis-1,3-Dichloropropene	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
m- and p-Xylene	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
o-Xylene	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
trans-1,2-Dichloroethene	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO
trans-1,3-Dichloropropene	13.0 - 34.0	0 / 3	--	--	NSV	-- / --	NSV	NO

NSV - No Screening Value
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Table 7-18
Surface Water Screening - Step 2
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Inorganics (UG/L)								
Aluminum	200 - 200	0 / 3	--	--	25.0	-- / --	8.00	YES
Antimony	60.0 - 60.0	0 / 3	--	--	30.0	-- / --	2.00	YES
Arsenic	10.0 - 10.0	1 / 3	3.80	IS28SW02-0503	150	0 / 3	0.025	NO
Barium	200 - 200	3 / 3	67.4	IS28SW01-0503	10,000	0 / 3	0.0067	NO
Beryllium	5.00 - 5.00	0 / 3	--	--	5.30	-- / --	0.94	NO
Cadmium	5.00 - 5.00	3 / 3	7.60	IS28SW03-0503	0.090	3 / 3	84.4	YES
Chromium	10.0 - 10.0	0 / 3	--	--	11.0	-- / --	0.91	NO
Cobalt	50.0 - 50.0	2 / 3	2.20	IS28SW02-0503	35,000	0 / 3	6.29E-05	NO
Copper	25.0 - 25.0	1 / 3	16.6	IS28SW03-0503	2.70	1 / 3	6.15	YES
Iron	100 - 100	2 / 3	6,600	IS28SW02-0503	1,000	1 / 3	6.60	YES
Lead	3.00 - 3.00	1 / 3	61.5	IS28SW02-0503	0.54	1 / 3	114	YES
Manganese	15.0 - 15.0	3 / 3	45.8	IS28SW02-0503	14,500	0 / 3	0.0032	NO
Mercury	0.20 - 0.20	0 / 3	--	--	0.77	-- / --	0.26	NO
Nickel	40.0 - 40.0	2 / 3	10.4	IS28SW01-0503	16.1	0 / 3	0.65	NO
Selenium	5.00 - 5.00	0 / 3	--	--	5.00	-- / --	1.00	YES
Silver	10.0 - 10.0	0 / 3	--	--	1.00E-04	-- / --	100,000	YES
Thallium	10.0 - 10.0	0 / 3	--	--	40.0	-- / --	0.25	NO
Vanadium	50.0 - 50.0	0 / 3	--	--	10,000	-- / --	0.0050	NO
Zinc	20.0 - 20.0	3 / 3	4,140	IS28SW02-0503	36.5	3 / 3	113	YES
Dissolved Metals (UG/L)								
Aluminum	200 - 200	0 / 3	--	--	25.0	-- / --	8.00	YES
Antimony	60.0 - 60.0	0 / 3	--	--	30.0	-- / --	2.00	YES
Arsenic	10.0 - 10.0	0 / 3	--	--	150	-- / --	0.067	NO
Barium	200 - 200	3 / 3	63.8	IS28SW01-0503	10,000	0 / 3	0.0064	NO
Beryllium	5.00 - 5.00	0 / 3	--	--	5.30	-- / --	0.94	NO
Cadmium	5.00 - 5.00	3 / 3	7.40	IS28SW02-0503	0.090	3 / 3	82.2	YES
Calcium [2]	5,000 - 5,000	3 / 3	6,240	IS28SW01-0503	NSV	-- / --	NSV	NO
Chromium	10.0 - 10.0	0 / 3	--	--	11.0	-- / --	0.91	NO

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Surface Water Screening - Step 2
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Cobalt	50.0 - 50.0	2 / 3	2.30	IS28SW02-0503	35,000	0 / 3	6.57E-05	NO
Copper	25.0 - 25.0	0 / 3	--	--	2.70	-- / --	9.26	YES
Iron	100 - 100	2 / 3	678	IS28SW02-0503	1,000	0 / 3	0.68	NO
Lead	3.00 - 3.00	0 / 3	--	--	0.54	-- / --	5.56	YES
Magnesium [2]	5,000 - 5,000	3 / 3	1,780	IS28SW01-0503	NSV	-- / --	NSV	NO
Manganese	15.0 - 15.0	3 / 3	44.2	IS28SW02-0503	14,500	0 / 3	0.0030	NO
Mercury	0.20 - 0.20	0 / 3	--	--	0.77	-- / --	0.26	NO
Nickel	40.0 - 40.0	2 / 3	4.50	IS28SW02-0503	16.1	0 / 3	0.28	NO
Potassium [2]	5,000 - 5,000	1 / 3	1,150	IS28SW03-0503	NSV	-- / --	NSV	NO
Selenium	5.00 - 5.00	0 / 3	--	--	5.00	-- / --	1.00	YES
Silver	10.0 - 10.0	0 / 3	--	--	1.00E-04	-- / --	100,000	YES
Sodium [2]	5,000 - 5,000	3 / 3	21,100	IS28SW01-0503	NSV	-- / --	NSV	NO
Thallium	10.0 - 10.0	0 / 3	--	--	40.0	-- / --	0.25	NO
Vanadium	50.0 - 50.0	0 / 3	--	--	10,000	-- / --	0.0050	NO
Zinc	20.0 - 20.0	3 / 3	4,420	IS28SW02-0503	36.5	3 / 3	121	YES
Semivolatile Organic Compounds (UG/L)								
1,1-Biphenyl	10.0 - 10.0	0 / 3	--	--	14.0	-- / --	0.71	NO
2,4,5-Trichlorophenol	25.0 - 25.0	0 / 3	--	--	63.0	-- / --	0.40	NO
2,4,6-Trichlorophenol	10.0 - 10.0	0 / 3	--	--	970	-- / --	0.010	NO
2,4-Dichlorophenol	10.0 - 10.0	0 / 3	--	--	365	-- / --	0.027	NO
2,4-Dimethylphenol	10.0 - 10.0	0 / 3	--	--	2,120	-- / --	0.0047	NO
2,4-Dinitrophenol	25.0 - 25.0	0 / 3	--	--	150	-- / --	0.17	NO
2,4-Dinitrotoluene	10.0 - 10.0	0 / 3	--	--	230	-- / --	0.043	NO
2,6-Dinitrotoluene	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
2-Chloronaphthalene	10.0 - 10.0	0 / 3	--	--	620	-- / --	0.016	NO
2-Chlorophenol	10.0 - 10.0	0 / 3	--	--	970	-- / --	0.010	NO
2-Methylnaphthalene	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
2-Methylphenol	10.0 - 10.0	0 / 3	--	--	13.0	-- / --	0.77	NO

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Surface Water Screening - Step 2
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
2-Nitroaniline	25.0 - 25.0	0 / 3	--	--	NSV	-- / --	NSV	NO
2-Nitrophenol	10.0 - 10.0	0 / 3	--	--	3,500	-- / --	0.0029	NO
3,3'-Dichlorobenzidine	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
3-Nitroaniline	25.0 - 25.0	0 / 3	--	--	NSV	-- / --	NSV	NO
4,6-Dinitro-2-methylphenol	25.0 - 25.0	0 / 3	--	--	NSV	-- / --	NSV	NO
4-Bromophenyl-phenylether	10.0 - 10.0	0 / 3	--	--	1.50	-- / --	6.67	YES
4-Chloro-3-methylphenol	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
4-Chloroaniline	10.0 - 10.0	0 / 3	--	--	50.0	-- / --	0.20	NO
4-Chlorophenyl-phenylether	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
4-Methylphenol	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
4-Nitroaniline	25.0 - 25.0	0 / 3	--	--	NSV	-- / --	NSV	NO
4-Nitrophenol	25.0 - 25.0	0 / 3	--	--	150	-- / --	0.17	NO
Acenaphthene	10.0 - 10.0	0 / 3	--	--	520	-- / --	0.019	NO
Acenaphthylene	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Acetophenone	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Anthracene	10.0 - 10.0	0 / 3	--	--	0.10	-- / --	100	YES
Atrazine	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Benzaldehyde	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Benzo(a)anthracene	10.0 - 10.0	0 / 3	--	--	6.30	-- / --	1.59	YES
Benzo(a)pyrene	10.0 - 10.0	0 / 3	--	--	0.014	-- / --	714	YES
Benzo(b)fluoranthene	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Benzo(g,h,i)perylene	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Benzo(k)fluoranthene	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Bis(2-chloro-1-methylethyl) ether	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Butylbenzylphthalate	10.0 - 10.0	0 / 3	--	--	3.00	-- / --	3.33	YES
Caprolactam	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Carbazole	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Chrysene	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Di-n-butylphthalate	10.0 - 10.0	0 / 3	--	--	0.30	-- / --	33.3	YES

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Table 7-18
Surface Water Screening - Step 2
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Di-n-octylphthalate	10.0 - 10.0	0 / 3	--	--	0.30	-- / --	33.3	YES
Dibenz(a,h)anthracene	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Dibenzofuran	10.0 - 10.0	0 / 3	--	--	3.70	-- / --	2.70	YES
Diethylphthalate	10.0 - 10.0	0 / 3	--	--	3.00	-- / --	3.33	YES
Dimethyl phthalate	10.0 - 10.0	0 / 3	--	--	3.00	-- / --	3.33	YES
Fluoranthene	10.0 - 10.0	0 / 3	--	--	3,980	-- / --	0.0025	NO
Fluorene	10.0 - 10.0	0 / 3	--	--	430	-- / --	0.023	NO
Hexachlorobenzene	10.0 - 10.0	0 / 3	--	--	3.68	-- / --	2.72	YES
Hexachlorobutadiene	10.0 - 10.0	0 / 3	--	--	9.30	-- / --	1.08	YES
Hexachlorocyclopentadiene	10.0 - 10.0	0 / 3	--	--	5.20	-- / --	1.92	YES
Hexachloroethane	10.0 - 10.0	0 / 3	--	--	540	-- / --	0.019	NO
Indeno(1,2,3-cd)pyrene	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Isophorone	10.0 - 10.0	0 / 3	--	--	117,000	-- / --	8.55E-05	NO
Naphthalene	10.0 - 10.0	0 / 3	--	--	100	-- / --	0.10	NO
Nitrobenzene	10.0 - 10.0	0 / 3	--	--	27,000	-- / --	3.70E-04	NO
Pentachlorophenol	25.0 - 25.0	0 / 3	--	--	15.0	-- / --	1.67	YES
Phenanthrene	10.0 - 10.0	0 / 3	--	--	6.30	-- / --	1.59	YES
Phenol	10.0 - 10.0	0 / 3	--	--	79.0	-- / --	0.13	NO
Pyrene	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
bis(2-Chloroethoxy)methane	10.0 - 10.0	0 / 3	--	--	11,000	-- / --	9.09E-04	NO
bis(2-Chloroethyl)ether	10.0 - 10.0	0 / 3	--	--	2,380	-- / --	0.0042	NO
bis(2-Ethylhexyl)phthalate	10.0 - 10.0	0 / 3	--	--	30.0	-- / --	0.33	NO
n-Nitroso-di-n-propylamine	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
n-Nitrosodiphenylamine	10.0 - 10.0	0 / 3	--	--	5,850	-- / --	0.0017	NO
Explosives (UG/L)								
1,3,5-Trinitrobenzene	0.26 - 0.26	0 / 3	--	--	NSV	-- / --	NSV	NO
1,3-Dinitrobenzene	0.26 - 0.26	0 / 3	--	--	NSV	-- / --	NSV	NO
2,4,6-Trinitrotoluene	0.26 - 0.26	0 / 3	--	--	NSV	-- / --	NSV	NO
2,4-Dinitrotoluene	0.26 - 0.26	0 / 3	--	--	230	-- / --	0.001	NO

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Table 7-18
Surface Water Screening - Step 2
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
2,6-Dinitrotoluene	0.26 - 0.26	0 / 3	--	--	NSV	-- / --	NSV	NO
2-Amino-4,6-dinitrotoluene	0.26 - 0.26	0 / 3	--	--	NSV	-- / --	NSV	NO
2-Nitrotoluene	0.52 - 0.52	0 / 3	--	--	NSV	-- / --	NSV	NO
3-Nitrotoluene	0.52 - 0.52	0 / 3	--	--	NSV	-- / --	NSV	NO
4-Amino-2,6-dinitrotoluene	0.26 - 0.26	0 / 3	--	--	NSV	-- / --	NSV	NO
4-Nitrotoluene	0.52 - 0.52	0 / 3	--	--	NSV	-- / --	NSV	NO
HMX	0.52 - 0.52	0 / 3	--	--	NSV	-- / --	NSV	NO
Nitrobenzene	0.26 - 0.26	1 / 3	0.15	IS28SW02-0503	27,000	0 / 3	5.56E-06	NO
Nitroglycerin	1,000 - 1,000	0 / 3	--	--	NSV	-- / --	NSV	NO
Nitroguanidine	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
PETN	1.30 - 1.30	0 / 3	--	--	NSV	-- / --	NSV	NO
Perchlorate	4.00 - 4.00	0 / 3	--	--	NSV	-- / --	NSV	NO
RDX	0.52 - 0.52	0 / 3	--	--	NSV	-- / --	NSV	NO
Tetryl	0.52 - 0.52	0 / 3	--	--	NSV	-- / --	NSV	NO
Volatile Organic Compounds (UG/L)								
1,1,1-Trichloroethane	10.0 - 10.0	0 / 3	--	--	9,400	-- / --	0.0011	NO
1,1,2,2-Tetrachloroethane	10.0 - 10.0	0 / 3	--	--	2,400	-- / --	0.0042	NO
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
1,1,2-Trichloroethane	10.0 - 10.0	0 / 3	--	--	9,400	-- / --	0.0011	NO
1,1-Dichloroethane	10.0 - 10.0	0 / 3	--	--	160,000	-- / --	6.25E-05	NO
1,1-Dichloroethene	10.0 - 10.0	0 / 3	--	--	11,600	-- / --	8.62E-04	NO
1,2,4-Trichlorobenzene	10.0 - 10.0	0 / 3	--	--	50.0	-- / --	0.20	NO
1,2-Dibromo-3-chloropropane	10.0 - 10.0	0 / 1	--	--	NSV	-- / --	NSV	NO
1,2-Dibromoethane	10.0 - 10.0	0 / 3	--	--	18,000	-- / --	5.56E-04	NO
1,2-Dichlorobenzene	10.0 - 10.0	0 / 3	--	--	763	-- / --	0.013	NO
1,2-Dichloroethane	10.0 - 10.0	0 / 3	--	--	20,000	-- / --	5.00E-04	NO
1,2-Dichloroethene (total)	10.0 - 10.0	0 / 2	--	--	NSV	-- / --	NSV	NO
1,2-Dichloropropane	10.0 - 10.0	0 / 3	--	--	5,700	-- / --	0.0018	NO
1,3-Dichlorobenzene	10.0 - 10.0	0 / 3	--	--	763	-- / --	0.013	NO

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Table 7-18
Surface Water Screening - Step 2
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
1,4-Dichlorobenzene	10.0 - 10.0	0 / 3	--	--	763	-- / --	0.013	NO
2-Butanone	10.0 - 10.0	0 / 3	--	--	3,220,000	-- / --	3.11E-06	NO
2-Hexanone	10.0 - 10.0	0 / 3	--	--	428,000	-- / --	2.34E-05	NO
4-Methyl-2-pentanone	10.0 - 10.0	0 / 3	--	--	460,000	-- / --	2.17E-05	NO
Acetone	10.0 - 10.0	0 / 3	--	--	9,000,000	-- / --	1.11E-06	NO
Benzene	10.0 - 10.0	0 / 3	--	--	5,300	-- / --	0.0019	NO
Bromodichloromethane	10.0 - 10.0	0 / 3	--	--	11,000	-- / --	9.09E-04	NO
Bromoform	10.0 - 10.0	0 / 3	--	--	11,000	-- / --	9.09E-04	NO
Bromomethane	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Carbon disulfide	10.0 - 10.0	0 / 3	--	--	2.00	-- / --	5.00	YES
Carbon tetrachloride	10.0 - 10.0	0 / 3	--	--	35,200	-- / --	2.84E-04	NO
Chlorobenzene	10.0 - 10.0	0 / 3	--	--	50.0	-- / --	0.20	NO
Chloroethane	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Chloroform	10.0 - 10.0	0 / 3	--	--	1,240	-- / --	0.0081	NO
Chloromethane	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Cumene	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Cyclohexane	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Dibromochloromethane	10.0 - 10.0	0 / 3	--	--	11,000	-- / --	9.09E-04	NO
Dichlorodifluoromethane(Freon-12)	10.0 - 10.0	0 / 3	--	--	11,000	-- / --	9.09E-04	NO
Ethylbenzene	10.0 - 10.0	0 / 3	--	--	32,000	-- / --	3.13E-04	NO
Methyl acetate	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Methyl-tert-butyl ether (MTBE)	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Methylcyclohexane	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Methylene chloride	10.0 - 10.0	0 / 3	--	--	11,000	-- / --	9.09E-04	NO
Styrene	10.0 - 10.0	0 / 3	--	--	NSV	-- / --	NSV	NO
Tetrachloroethene	10.0 - 10.0	0 / 3	--	--	840	-- / --	0.012	NO
Toluene	10.0 - 10.0	0 / 3	--	--	17,000	-- / --	5.88E-04	NO
Trichloroethene	10.0 - 10.0	0 / 3	--	--	21,900	-- / --	4.57E-04	NO
Trichlorofluoromethane(Freon-11)	10.0 - 10.0	0 / 3	--	--	11,000	-- / --	9.09E-04	NO

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Table 7-18
Surface Water Screening - Step 2
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Vinyl chloride	10.0 - 10.0	0 / 3	--	--	11,600	-- / --	8.62E-04	NO
Xylene, total	10.0 - 10.0	0 / 3	--	--	6,000	-- / --	0.0017	NO
cis-1,2-Dichloroethene	10.0 - 10.0	0 / 3	--	--	11,600	-- / --	8.62E-04	NO
cis-1,3-Dichloropropene	10.0 - 10.0	0 / 3	--	--	244	-- / --	0.041	NO
m- and p-Xylene	10.0 - 10.0	0 / 2	--	--	NSV	-- / --	NSV	NO
o-Xylene	10.0 - 10.0	0 / 2	--	--	NSV	-- / --	NSV	NO
trans-1,2-Dichloroethene	10.0 - 10.0	0 / 3	--	--	11,600	-- / --	8.62E-04	NO
trans-1,3-Dichloropropene	10.0 - 10.0	0 / 3	--	--	244	-- / --	0.041	NO

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Table 7-19
Mattawoman Creek Sediment Screening - Step 2
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Inorganics (MG/KG)								
Aluminum	34.0 - 110	10 / 10	18,400	IS28SD120006	25,500	0 / 10	0.72	NO
Antimony	10.0 - 32.0	0 / 10	--	--	150	-- / --	0.21	NO
Arsenic	1.70 - 5.30	7 / 10	8.20	IS28SD110006	8.20	1 / 10	1.00	**YES**
Barium	34.0 - 110	10 / 10	134	IS28SD120006	NSV	-- / --	NSV	**YES**
Beryllium	0.84 - 2.60	9 / 10	1.00	IS28SD120006	NSV	-- / --	NSV	**YES**
Cadmium	0.84 - 2.60	0 / 10	--	--	1.20	-- / --	2.17	**YES**
Chromium	1.70 - 5.30	10 / 10	27.8	IS28SD120006	5.00	9 / 10	5.56	**YES**
Cobalt	8.40 - 26.0	10 / 10	13.2	IS28SD130006	NSV	-- / --	NSV	**YES**
Copper	4.20 - 13.0	10 / 10	23.9	IS28SD110006	34.0	0 / 10	0.70	NO
Iron	17.0 - 53.0	10 / 10	26,600	IS28SD130006	188,400	0 / 10	0.14	NO
Lead	0.51 - 1.60	10 / 10	36.7	IS28SD110006	46.7	0 / 10	0.79	NO
Manganese	2.50 - 8.00	10 / 10	891	IS28SD130006	1,673	0 / 10	0.53	NO
Mercury	0.073 - 0.29	1 / 10	0.44	IS28SD110006	0.15	1 / 10	2.93	**YES**
Nickel	6.80 - 21.0	10 / 10	20.9	IS28SD120006	20.9	1 / 10	1.00	**YES**
Selenium	0.84 - 2.60	1 / 10	0.85	IS28SD100006	NSV	-- / --	NSV	**YES**
Silver	1.70 - 5.30	9 / 10	4.00	IS28SD110006	1.00	8 / 10	4.00	**YES**
Thallium	1.70 - 5.30	0 / 10	--	--	NSV	-- / --	NSV	NO
Vanadium	8.40 - 26.0	10 / 10	38.2	IS28SD120006	NSV	-- / --	NSV	**YES**
Zinc	3.40 - 11.0	10 / 10	159	IS28SD110006	150	1 / 10	1.06	**YES**
Semivolatile Organic Compounds (UG/KG)								
1,1-Biphenyl	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO
2,4,5-Trichlorophenol	1,000 - 2,500	0 / 2	--	--	NSV	-- / --	NSV	NO
2,4,6-Trichlorophenol	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO
2,4-Dichlorophenol	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO
2,4-Dimethylphenol	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO
2,4-Dinitrophenol	1,000 - 2,500	0 / 2	--	--	29.0	-- / --	34.5	**YES**
2,4-Dinitrotoluene	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO
2,6-Dinitrotoluene	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO

NSV - No Screening Value
1 - Shaded cells: HQ based on reporting limits; '--' indicates chemical was not detected and reporting limits were not available

Table 7-19
Mattawoman Creek Sediment Screening - Step 2
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
2-Chloronaphthalene	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO
2-Chlorophenol	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO
2-Methylnaphthalene	400 - 1,000	0 / 2	--	--	70.0	-- / --	14.3*	YES
2-Methylphenol	400 - 1,000	0 / 2	--	--	63.0	-- / --	15.9*	YES
2-Nitroaniline	1,000 - 2,500	0 / 2	--	--	NSV	-- / --	NSV	NO
2-Nitrophenol	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO
3,3'-Dichlorobenzidine	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO
3-Nitroaniline	1,000 - 2,500	0 / 2	--	--	NSV	-- / --	NSV	NO
4,6-Dinitro-2-methylphenol	1,000 - 2,500	0 / 2	--	--	NSV	-- / --	NSV	NO
4-Bromophenyl-phenylether	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO
4-Chloro-3-methylphenol	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO
4-Chloroaniline	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO
4-Chlorophenyl-phenylether	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO
4-Methylphenol	400 - 1,000	0 / 2	--	--	670	-- / --	1.49*	YES
4-Nitroaniline	1,000 - 2,500	0 / 2	--	--	NSV	-- / --	NSV	NO
4-Nitrophenol	1,000 - 2,500	0 / 2	--	--	NSV	-- / --	NSV	NO
Acenaphthene	400 - 1,000	0 / 2	--	--	16.0	-- / --	62.5*	YES
Acenaphthylene	400 - 1,000	0 / 2	--	--	44.0	-- / --	22.7*	YES
Acetophenone	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO
Anthracene	400 - 1,000	0 / 2	--	--	85.3	-- / --	11.7*	YES
Atrazine	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO
Benzaldehyde	400 - 1,000	1 / 2	160	IS28SD110006	NSV	-- / --	NSV	YES
Benzo(a)anthracene	400 - 1,000	0 / 2	--	--	261	-- / --	3.83*	YES
Benzo(a)pyrene	400 - 1,000	0 / 2	--	--	430	-- / --	2.33*	YES
Benzo(b)fluoranthene	400 - 1,000	1 / 2	70.0	IS28SD110006	3,200	0 / 2	0.022	NO
Benzo(g,h,i)perylene	400 - 1,000	0 / 2	--	--	670	-- / --	1.49*	YES
Benzo(k)fluoranthene	400 - 1,000	0 / 2	--	--	240	-- / --	4.17*	YES
Bis(2-chloro-1-methylethyl) ether	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO
Butylbenzylphthalate	400 - 1,000	0 / 2	--	--	63.0	-- / --	15.9*	YES

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Table 7-19
Mattawoman Creek Sediment Screening - Step 2
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
Caprolactam	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO
Carbazole	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO
Chrysene	400 - 1,000	1 / 2	67.0	IS28SD110006	384	0 / 2	0.17	NO
Di-n-butylphthalate	400 - 1,000	0 / 2	--	--	1,400	-- / --	0.71	NO
Di-n-octylphthalate	400 - 1,000	0 / 2	--	--	6,200	-- / --	0.16	NO
Dibenz(a,h)anthracene	400 - 1,000	0 / 2	--	--	63.4	-- / --	15.8	YES
Dibenzofuran	400 - 1,000	0 / 2	--	--	540	-- / --	1.85	YES
Diethylphthalate	400 - 1,000	1 / 2	37.0	IS28SD090006	200	0 / 2	0.19	NO
Dimethyl phthalate	400 - 1,000	0 / 2	--	--	71.0	-- / --	14.1	YES
Fluoranthene	400 - 1,000	1 / 2	92.0	IS28SD110006	600	0 / 2	0.15	NO
Fluorene	400 - 1,000	0 / 2	--	--	19.0	-- / --	52.6	YES
Hexachlorobenzene	400 - 1,000	0 / 2	--	--	22.0	-- / --	45.5	YES
Hexachlorobutadiene	400 - 1,000	0 / 2	--	--	11.0	-- / --	90.9	YES
Hexachlorocyclopentadiene	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO
Hexachloroethane	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO
Indeno(1,2,3-cd)pyrene	400 - 1,000	0 / 2	--	--	600	-- / --	1.67	YES
Isophorone	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO
Naphthalene	400 - 1,000	0 / 2	--	--	160	-- / --	6.25	YES
Nitrobenzene	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO
Pentachlorophenol	1,000 - 2,500	0 / 2	--	--	360	-- / --	6.94	YES
Phenanthrene	400 - 1,000	0 / 2	--	--	240	-- / --	4.17	YES
Phenol	400 - 1,000	0 / 2	--	--	420	-- / --	2.38	YES
Pyrene	400 - 1,000	1 / 2	97.0	IS28SD110006	665	0 / 2	0.15	NO
bis(2-Chloroethoxy)methane	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO
bis(2-Chloroethyl)ether	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO
bis(2-Ethylhexyl)phthalate	400 - 1,000	1 / 2	29.0	IS28SD090006	1,300	0 / 2	0.022	NO
n-Nitroso-di-n-propylamine	400 - 1,000	0 / 2	--	--	NSV	-- / --	NSV	NO
n-Nitrosodiphenylamine	400 - 1,000	1 / 2	79.0	IS28SD110006	28.0	1 / 2	2.82	YES
Explosives (UG/KG)								

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Table 7-19
Mattawoman Creek Sediment Screening - Step 2
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Screening Value	Frequency of Exceedance	Maximum Hazard Quotient[1]	COPC?
1,3,5-Trinitrobenzene	100 - 100	0 / 2	--	--	NSV	-- / --	NSV	NO
1,3-Dinitrobenzene	100 - 100	0 / 2	--	--	NSV	-- / --	NSV	NO
2,4,6-Trinitrotoluene	100 - 100	0 / 2	--	--	NSV	-- / --	NSV	NO
2,4-Dinitrotoluene	100 - 100	0 / 2	--	--	NSV	-- / --	NSV	NO
2,6-Dinitrotoluene	100 - 100	0 / 2	--	--	NSV	-- / --	NSV	NO
2-Amino-4,6-dinitrotoluene	100 - 100	0 / 2	--	--	NSV	-- / --	NSV	NO
2-Nitrotoluene	200 - 200	0 / 2	--	--	NSV	-- / --	NSV	NO
3-Nitrotoluene	200 - 200	0 / 2	--	--	NSV	-- / --	NSV	NO
4-Amino-2,6-dinitrotoluene	100 - 100	0 / 2	--	--	NSV	-- / --	NSV	NO
4-Nitrotoluene	200 - 200	0 / 2	--	--	NSV	-- / --	NSV	NO
HMX	200 - 200	0 / 2	--	--	NSV	-- / --	NSV	NO
Nitrobenzene	100 - 100	0 / 2	--	--	NSV	-- / --	NSV	NO
Nitroglycerin	5,700 - 14,000	0 / 2	--	--	NSV	-- / --	NSV	NO
Nitroguanidine	130 - 130	0 / 2	--	--	NSV	-- / --	NSV	NO
PETN	500 - 500	0 / 2	--	--	NSV	-- / --	NSV	NO
Perchlorate	40.0 - 80.0	0 / 2	--	--	NSV	-- / --	NSV	NO
RDX	200 - 200	0 / 2	--	--	NSV	-- / --	NSV	NO
Tetryl	200 - 200	0 / 2	--	--	NSV	-- / --	NSV	NO

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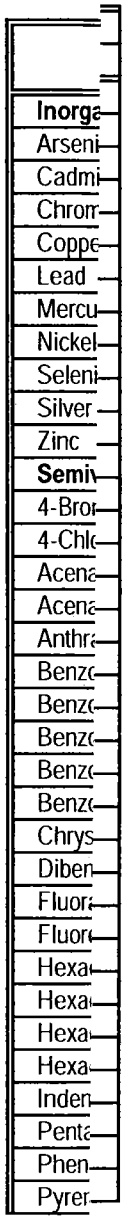
Chemical	Short-tailed shrew				Mallard		Tree swallow	
	NOAEL	LOAEL	EL		NOAEL	LOAEL	NOAEL	LOAEL
Inorganics								
Arsenic	136.17	27.03			6.24	2.50	6.86	2.29
Cadmium	677.41	67.74			9.00	0.65	63.13	4.58
Chromium	21.07	4.21			1.70	0.34	10.93	2.19
Copper	3.35	2.51			0.49	0.37	1.83	1.40
Lead	258.99	25.90			54.32	5.43	80.86	16.17
Mercury	885.17	177.03			12.72	4.24	8.45	3.45
Nickel	0.73	0.37			0.12	0.09	0.10	0.07
Selenium	10.19	6.18			3.60	1.80	4.06	1.19
Silver	3.61	0.72			0.04	<0.01	0.95	0.19
Zinc	698.18	349.09			316.70	35.05	1318.87	145.98
Semivolatile Organics								
1,2,4-Trichlorobenzene	<0.01	<0.01			<0.01	<0.01	<0.01	<0.01
1,2-Dichlorobenzene	<0.01	<0.01			<0.01	<0.01	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01			<0.01	<0.01	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01			<0.01	<0.01	<0.01	<0.01
4-Bromophenyl-phenylether	NA	NA			NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA			NA	NA	NA	NA
Acenaphthene	<0.01	<0.01			0.01	<0.01	0.02	<0.01
Acenaphthylene	<0.01	<0.01			<0.01	<0.01	0.02	<0.01
Anthracene	<0.01	<0.01			<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	0.02	<0.01			<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	0.03	<0.01			<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	0.04	<0.01			<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	0.01	<0.01			<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	0.02	<0.01			<0.01	<0.01	<0.01	<0.01
Chrysene	0.02	<0.01			<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	0.02	<0.01			<0.01	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01			<0.01	<0.01	0.01	<0.01
Fluorene	<0.01	<0.01			0.23	0.05	0.51	0.10
Hexachlorobenzene	0.03	0.02			<0.01	<0.01	0.01	<0.01
Hexachlorobutadiene	<0.01	<0.01			NA	NA	NA	NA
Hexachlorocyclopentadiene	<0.01	<0.01			NA	NA	NA	NA
Hexachloroethane	<0.01	<0.01			<0.01	<0.01	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	0.04	<0.01			0.02	<0.01	0.04	0.02
Pentachlorophenol	0.03	<0.01			<0.01	<0.01	<0.01	<0.01
Phenanthrene	<0.01	<0.01			<0.01	<0.01	<0.01	<0.01
Pyrene	0.02	<0.01						
Volatile Organics								
1,1,2,2-Tetrachloroethane	<0.01	<0.01			NA	NA	NA	NA


Inorga
Arseni
Cadmi
Chrom
Coppe
Lead
Mercu
Nickel
Seleni
Silver
Zinc
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Diben
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Hexa
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Penta
Phen
Pyren

Table 7-22
Summary of COPCs
Site 28
IHDIV-NSWC

Chemical	SS COPC?	Onsite SD COPC?	SW COPC?	Mattawoman Creek COPC?	Site Food Web COPC?	MCFood Web COPC?
Inorganics						
Aluminum	YES	NO	YES	NO	NO	NO
Antimony	YES	NO	YES	NO	NO	NO
Arsenic	YES	YES	NO	YES	YES	YES
Barium	YES	YES	NO	YES	NO	NO
Beryllium	YES	YES	NO	YES	NO	NO
Cadmium	YES	YES	YES	YES	YES	NO
Chromium	YES	YES	NO	YES	YES	NO
Cobalt	NO	YES	NO	YES	NO	NO
Copper	YES	YES	YES	NO	YES	NO
Iron	YES	NO	YES	NO	NO	NO
Lead	YES	YES	YES	NO	YES	YES
Manganese	YES	NO	NO	NO	NO	NO
Mercury	YES	YES	NO	YES	YES	YES
Nickel	YES	YES	NO	YES	NO	NO
Selenium	NO	YES	YES	YES	YES	YES
Silver	YES	YES	YES	YES	YES	NO
Thallium	YES	NO	NO	NO	NO	NO
Vanadium	YES	YES	NO	YES	NO	NO
Zinc	YES	YES	YES	YES	YES	YES
Semivolatile Organic Compounds						
1,1-Biphenyl	NO	NO	NO	NO	NO	NO
2,4,5-Trichlorophenol	YES	NO	NO	NO	NO	NO
2,4,6-Trichlorophenol	YES	NO	NO	NO	NO	NO
2,4-Dichlorophenol	YES	NO	NO	NO	NO	NO
2,4-Dimethylphenol	NO	YES	NO	YES	NO	NO
2,4-Dinitrophenol	YES	NO	NO	NO	NO	NO
2,4-Dinitrotoluene	YES	YES	NO	NO	NO	NO
2,6-Dinitrotoluene	YES	NO	NO	NO	NO	NO

NSV - No Screening Value
1 - Shaded cells indicate hazard quotient based on reporting limits
2 - Macronutrient - Not considered to be a COPC

Table 7-22
Summary of COPCs
Site 28
IHDIV-NSWC

Chemical	SS COPC?	Onsite SD COPC?	SW COPC?	Mattawoman Creek COPC?	Site Food Web COPC?	MCFood Web COPC?
2-Chloronaphthalene	YES	NO	NO	NO	NO	NO
2-Chlorophenol	YES	NO	NO	NO	NO	NO
2-Methylnaphthalene	YES	YES	NO	YES	NO	NO
2-Methylphenol	NO	YES	NO	YES	NO	NO
2-Nitroaniline	YES	NO	NO	NO	NO	NO
2-Nitrophenol	YES	NO	NO	NO	NO	NO
3,3'-Dichlorobenzidine	NO	NO	NO	NO	NO	NO
3-Nitroaniline	NO	NO	NO	NO	NO	NO
4,6-Dinitro-2-methylphenol	YES	NO	NO	NO	NO	NO
4-Bromophenyl-phenylether	YES	NO	YES	NO	YES	YES
4-Chloro-3-methylphenol	YES	NO	NO	NO	NO	NO
4-Chloroaniline	NO	NO	NO	NO	NO	NO
4-Chlorophenyl-phenylether	YES	NO	NO	NO	YES	YES
4-Methylphenol	NO	YES	NO	YES	NO	NO
4-Nitroaniline	NO	NO	NO	NO	NO	NO
4-Nitrophenol	YES	NO	NO	NO	NO	NO
Acenaphthene	YES	YES	NO	YES	NO	NO
Acenaphthylene	YES	YES	NO	YES	NO	NO
Acetophenone	YES	NO	NO	NO	NO	NO
Anthracene	YES	YES	YES	YES	NO	NO
Atrazine	YES	NO	NO	NO	NO	NO
Benzaldehyde	YES	NO	NO	YES	NO	NO
Benzo(a)anthracene	YES	NO	YES	YES	NO	NO
Benzo(a)pyrene	YES	NO	YES	YES	NO	NO
Benzo(b)fluoranthene	YES	NO	NO	NO	NO	NO
Benzo(g,h,i)perylene	YES	NO	NO	YES	NO	NO
Benzo(k)fluoranthene	YES	NO	NO	YES	NO	NO
Bis(2-chloro-1-methylethyl) ether	YES	NO	NO	NO	NO	NO
Butylbenzylphthalate	YES	NO	YES	YES	NO	NO

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Table 7-22
Summary of COPCs
Site 28
IHDIV-NSWC

Chemical	SS COPC?	Onsite SD COPC?	SW COPC?	Mattawoman Creek COPC?	Site Food Web COPC?	MCFood Web COPC?
Caprolactam	YES	NO	NO	NO	NO	NO
Carbazole	YES	NO	NO	NO	NO	NO
Chrysene	YES	NO	NO	NO	NO	NO
Di-n-butylphthalate	NO	NO	YES	NO	NO	NO
Di-n-octylphthalate	YES	NO	YES	NO	NO	NO
Dibenz(a,h)anthracene	YES	YES	NO	YES	NO	NO
Dibenzofuran	YES	YES	YES	YES	NO	NO
Diethylphthalate	NO	YES	YES	NO	NO	NO
Dimethyl phthalate	NO	YES	YES	YES	NO	NO
Fluoranthene	YES	NO	NO	NO	NO	NO
Fluorene	YES	YES	NO	YES	NO	NO
Hexachlorobenzene	NO	YES	YES	YES	YES	YES
Hexachlorobutadiene	YES	YES	YES	YES	NO	NO
Hexachlorocyclopentadiene	NO	NO	YES	NO	NO	NO
Hexachloroethane	YES	NO	NO	NO	NO	NO
Indeno(1,2,3-cd)pyrene	YES	NO	NO	YES	NO	NO
Isophorone	YES	NO	NO	NO	NO	NO
Naphthalene	YES	YES	NO	YES	NO	NO
Nitrobenzene	NO	NO	NO	NO	NO	NO
Pentachlorophenol	YES	YES	YES	YES	NO	NO
Phenanthrene	YES	NO	YES	YES	NO	NO
Phenol	YES	YES	NO	YES	NO	NO
Pyrene	YES	NO	NO	NO	NO	NO
bis(2-Chloroethoxy)methane	YES	NO	NO	NO	NO	NO
bis(2-Chloroethyl)ether	YES	NO	NO	NO	NO	NO
bis(2-Ethylhexyl)phthalate	YES	NO	NO	NO	NO	NO
n-Nitroso-di-n-propylamine	YES	NO	NO	NO	NO	NO
n-Nitrosodiphenylamine	NO	YES	NO	YES	NO	NO
Explosives						

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Table 7-22
Summary of COPCs
Site 28
IHDIV-NSWC

Chemical	SS COPC?	Onsite SD COPC?	SW COPC?	Mattawoman Creek COPC?	Site Food Web COPC?	MCFood Web COPC?
1,3,5-Trinitrobenzene	YES	NO	NO	NA	NO	NO
1,3-Dinitrobenzene	NO	NO	NO	NA	NO	NO
2,4,6-Trinitrotoluene	YES	NO	NO	NA	NO	NO
2,4-Dinitrotoluene	YES	YES	NO	NA	NO	NO
2,6-Dinitrotoluene	NO	NO	NO	NA	NO	NO
2-Amino-4,6-dinitrotoluene	NO	YES	NO	NA	NO	NO
2-Nitrotoluene	NO	NO	NO	NA	NO	NO
3-Nitrotoluene	NO	NO	NO	NA	NO	NO
4-Amino-2,6-dinitrotoluene	NO	YES	NO	NA	NO	NO
4-Nitrotoluene	NO	NO	NO	NA	NO	NO
HMX	YES	NO	NO	NA	NO	NO
Nitrobenzene	NO	NO	NO	NA	NO	NO
Nitroglycerin	NO	YES	NO	NA	NO	NO
Nitroguanidine	NO	NO	NO	NA	NO	NO
PETN	NO	NO	NO	NA	NO	NO
Perchlorate	NO	NO	NO	NA	NO	NO
RDX	NO	NO	NO	NA	NO	NO
Tetryl	YES	NO	NO	NA	NO	NO
Volatile Organic Compounds					NO	NO
1,1,1-Trichloroethane	NO	YES	NO	NA	NO	NO
1,1,2,2-Tetrachloroethane	NO	NO	NO	NA	NO	NO
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NO	NO	NO	NA	NO	NO
1,1,2-Trichloroethane	NO	YES	NO	NA	NO	NO
1,1-Dichloroethane	NO	NO	NO	NA	NO	NO
1,1-Dichloroethene	NO	NO	NO	NA	NO	NO
1,2,4-Trichlorobenzene	NO	NO	NO	NA	NO	NO
1,2-Dibromo-3-chloropropane	NO	NO	NO	NA	NO	NO
1,2-Dibromoethane	NO	NO	NO	NA	NO	NO
1,2-Dichlorobenzene	NO	NO	NO	NA	NO	NO

NSV - No Screening Value
1 - Shaded cells indicate hazard quotient based on reporting limits
2 - Macronutrient - Not considered to be a COPC

Table 7-22
Summary of COPCs
Site 28
IHDIV-NSWC

Chemical	SS COPC?	Onsite SD COPC?	SW COPC?	Mattawoman Creek COPC?	Site Food Web COPC?	MCFood Web COPC?
1,2-Dichloroethane	NO	NO	NO	NA	NO	NO
1,2-Dichloroethene (total)	YES	YES	NO	NA	NO	NO
1,2-Dichloropropane	NO	NO	NO	NA	NO	NO
1,3-Dichlorobenzene	NO	NO	NO	NA	NO	NO
1,4-Dichlorobenzene	NO	NO	NO	NA	NO	NO
2-Butanone	NO	NO	NO	NA	NO	NO
2-Hexanone	NO	NO	NO	NA	NO	NO
4-Methyl-2-pentanone	NO	NO	NO	NA	NO	NO
Acetone	NO	YES	NO	NA	NO	NO
Benzene	NO	NO	NO	NA	NO	NO
Bromodichloromethane	NO	NO	NO	NA	NO	NO
Bromoform	NO	NO	NO	NA	NO	NO
Bromomethane	NO	NO	NO	NA	NO	NO
Carbon disulfide	NO	NO	YES	NA	NO	NO
Carbon tetrachloride	NO	NO	NO	NA	NO	NO
Chlorobenzene	NO	NO	NO	NA	NO	NO
Chloroethane	NO	NO	NO	NA	NO	NO
Chloroform	NO	NO	NO	NA	NO	NO
Chloromethane	NO	NO	NO	NA	NO	NO
Cumene	YES	NO	NO	NA	NO	NO
Cyclohexane	NO	NO	NO	NA	NO	NO
Dibromochloromethane	NO	NO	NO	NA	NO	NO
Dichlorodifluoromethane(Freon-12)	NO	NO	NO	NA	NO	NO
Ethylbenzene	NO	YES	NO	NA	NO	NO
Methyl acetate	YES	NO	NO	NA	NO	NO
Methyl-tert-butyl ether (MTBE)	YES	YES	NO	NA	NO	NO
Methylcyclohexane	NO	NO	NO	NA	NO	NO
Methylene chloride	NO	NO	NO	NA	NO	NO
Styrene	NO	NO	NO	NA	NO	NO

NSV - No Screening Value
1 - Shaded cells indicate hazard quotient based on reporting limits
2 - Macronutrient - Not considered to be a COPC

Table 7-22
Summary of COPCs
Site 28
IHDIV-NSWC

Chemical	SS COPC?	Onsite SD COPC?	SW COPC?	Mattawoman Creek COPC?	Site Food Web COPC?	MCFood Web COPC?
Tetrachloroethene	NO	NO	NO	NA	NO	NO
Toluene	NO	NO	NO	NA	NO	NO
Trichloroethene	NO	NO	NO	NA	NO	NO
Trichlorofluoromethane(Freon-11)	NO	NO	NO	NA	NO	NO
Vinyl chloride	NO	NO	NO	NA	NO	NO
Xylene, total	NO	NO	NO	NA	NO	NO
cis-1,2-Dichloroethene	NO	YES	NO	NA	NO	NO
cis-1,3-Dichloropropene	NO	NO	NO	NA	NO	NO
m- and p-Xylene	YES	NO	NO	NA	NO	NO
o-Xylene	NO	NO	NO	NA	NO	NO
trans-1,2-Dichloroethene	NO	NO	NO	NA	NO	NO
trans-1,3-Dichloropropene	NO	NO	NO	NA	NO	NO

NSV - No Screening Value
1 - Shaded cells indicate hazard quotient based on reporting limits
2 - Macronutrient - Not considered to be a COPC

Table 7-23
Exposure Parameters for Upper Trophic Level Ecological Receptors - Step 3
Site 28
IHDIV-NSWC

Receptor	Body Weight (kg)		Water Ingestion Rate (L/day)		Food Ingestion Rate (kg/day - dry)	
	Value	Reference	Value	Reference	Value	Reference
Birds						
American robin	0.077	USEPA 1993a	0.0106	allometric equation	0.0055	Levey and Karasov 1989
Great blue heron	2.23	Quinney 1982	0.1010	allometric equation	0.3931	allometric equation
Eastern screech-owl	0.181	Dunning 1993	0.0188	allometric equation	0.0191	allometric equation
Mallard	1.18	Bellrose 1980	0.0658	allometric equation	0.0647	allometric equation
Mourning dove	0.127	Tomlinson et al. 1994	0.0148	allometric equation	0.0151	allometric equation
Tree swallow	0.020	Dunning 1993	0.0043	allometric equation	0.0009	Sample et al. 1997
Mammals						
Gray fox	4.21	Silva and Downing 1995	0.3610	allometric equation	0.2239	allometric equation
Meadow vole	0.043	Silva and Downing 1995	0.0090	USEPA 1993a	0.0021	USEPA 1993a
Mink	0.777	Silva and Downing 1995	0.0218	USEPA 1993a	0.0263	USEPA 1993a
Muskrat	1.17	Silva and Downing 1995	0.1139	allometric equation	0.0596	USEPA 1993a
Short-tailed shrew	0.017	USEPA 1993a	0.0038	USEPA 1993a	0.0015	USEPA 1993a

Table 7-23
Exposure Parameters for Upper Trophic Level Ecological Receptors - Step 3
Site 28
IHDIV-NSWC

Receptor	Dietary Composition (percent)							Soil/ Sediment Ingestion (percent)	
	Terr. Plants	Soil Invert.	Small Mammals	Fish/ Frogs	Aquatic Plants	Benthic Invert.	Reference	Value	Reference
Birds									
American robin	51.9	43.5	0	0	0	0	Martin et al: 1951	4.6	Sample and Suter 1994
Great blue heron	0	0	0	100	0	0	USEPA 1993a; Quinney and Smith 1980	0	Sample and Suter 1994
Eastern screech-owl	0	28.0	70.0	0	0	0	Johnsgard 19??	2.0	Assumed based on diet
Mallard	0	0	0	0	86.7	10.0	Palmer 1976	3.3	Beyer et al. 1994
Mourning dove	95.0	0	0	0	0	0	Tomlinson et al. 1994	5.0	Assumed based on diet
Tree swallow	17.0	18.0	0	0	0	65	Sample et al. 1997	0	Sample et al. 1997
Mammals									
Gray fox	32.0	6.0	59.2	0	0	0	NISC 1996	2.8	Beyer et al. 1994 (red fox)
Meadow vole	95.6	2	0	0	0	0	USEPA 1993a	2.4	Beyer et al. 1994
Mink	0	0	0	94.0	1.0	5.0	USEPA 1993a	0	Sample and Suter 1994
Muskrat	0	0	0	0	90.6	0	USEPA 1993a	9.4	Beyer et al. 1994 (raccoon)
Short-tailed shrew	4.7	82.3	0	0	0	0	USEPA 1993a; Sample and Suter 1994	13.0	Sample and Suter 1994

Table 7-24
Soil Bioconcentration Factors For Plants and Soil Invertebrates - Step 3
Site 28
IHDIV-NSWC

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)	
	Value	Reference	Value	Reference
Inorganics				
Arsenic	0.037	Bechtel Jacobs 1998a	0.258	Sample et al. 1998a
Cadmium	0.514	Bechtel Jacobs 1998a	7.660	Sample et al. 1998a
Chromium	0.048	Bechtel Jacobs 1998a	0.320	Sample et al. 1998a
Copper	0.123	Bechtel Jacobs 1998a	0.468	Sample et al. 1998a
Lead	0.038	Bechtel Jacobs 1998a	0.307	Sample et al. 1998a
Mercury	0.344	Bechtel Jacobs 1998a	1.186	Sample et al. 1998a
Nickel	0.034	Bechtel Jacobs 1998a	1.656	Sample et al. 1998a
Selenium	0.567	Bechtel Jacobs 1998a	0.982	Sample et al. 1998a
Silver	0.013	Bechtel Jacobs 1998a	2.045	Sample et al. 1998a
Tin	0.030	Baes et al. 1984	1.000	--
Zinc	0.358	Bechtel Jacobs 1998a	2.482	Sample et al. 1998a
Semivolatile Organics				
1,2,4-Trichlorobenzene	0.1863	Travis and Arms 1988	0.56	Beyer 1996
1,2-Dichlorobenzene	0.4031	Travis and Arms 1988	1.00	--
1,3-Dichlorobenzene	0.3673	Travis and Arms 1988	1.00	--
1,4-Dichlorobenzene	0.4085	Travis and Arms 1988	1.00	--
4-Bromophenyl-phenylether	0.0499	Travis and Arms 1988	1.00	--
4-Chlorophenyl-phenylether	0.0533	Travis and Arms 1988	1.00	--
Acenaphthene	0.2100	Travis and Arms 1988	0.30	Beyer and Stafford 1993
Acenaphthylene	0.1653	Travis and Arms 1988	0.22	Beyer and Stafford 1993
Anthracene	0.0908	Travis and Arms 1988	0.32	Beyer and Stafford 1993
Benzo(a)anthracene	0.0197	Travis and Arms 1988	0.27	Beyer and Stafford 1993
Benzo(a)pyrene	0.0114	Travis and Arms 1988	0.34	Beyer and Stafford 1993
Benzo(b)fluoranthene	0.0101	Travis and Arms 1988	0.21	Beyer and Stafford 1993
Benzo(g,h,i)perylene	0.0052	Travis and Arms 1988	0.15	Beyer and Stafford 1993
Benzo(k)fluoranthene	0.0101	Travis and Arms 1988	0.21	Beyer and Stafford 1993
Chrysene	0.0197	Travis and Arms 1988	0.44	Beyer and Stafford 1993
Dibenz(a,h)anthracene	0.0053	Travis and Arms 1988	0.49	Beyer and Stafford 1993
Fluoranthene	0.0425	Travis and Arms 1988	0.37	Beyer and Stafford 1993
Fluorene	0.1428	Travis and Arms 1988	0.20	Beyer and Stafford 1993

Table 7-24
Soil Bioconcentration Factors For Plants and Soil Invertebrates - Step 3
Site 28
IHDIV-NSWC

Chemical	Soil-Plant BCF (dry weight)		Soil-Invertebrate BAF (dry weight)	
	Value	Reference	Value	Reference
Hexachlorobenzene	0.0153	Travis and Arms 1988	1.69	Beyer 1996
Hexachlorobutadiene	0.0642	Travis and Arms 1988	1.00	--
Hexachlorocyclopentadiene	0.0297	Travis and Arms 1988	1.00	--
Hexachloroethane	0.1888	Travis and Arms 1988	1.00	--
Indeno(1,2,3-cd)pyrene	0.0056	Travis and Arms 1988	0.41	Beyer and Stafford 1993
Pentachlorophenol	0.0443	Travis and Arms 1988	5.18	van Gestel and Ma 1988
Phenanthrene	0.0908	Travis and Arms 1988	0.28	Beyer and Stafford 1993
Pyrene	0.0431	Travis and Arms 1988	0.39	Beyer and Stafford 1993
Volatile Organics				
1,1,2,2-Tetrachloroethane	1.6091	Travis and Arms 1988	1.00	--

Table 7-25
Soil Bioaccumulation Factors for Small Mammals - Step 3
Site 28
IHDIV-NSWC

Chemical	Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference
Inorganics						
Arsenic	0.003	Sample et al. 1998b	0.005	Sample et al. 1998b	0.004	Sample et al. 1998b
Cadmium	0.144	Sample et al. 1998b	0.134	Sample et al. 1998b	2.212	Sample et al. 1998b
Chromium	0.092	Sample et al. 1998b	0.088	Sample et al. 1998b	0.094	Sample et al. 1998b
Copper	0.111	Sample et al. 1998b	0.109	Sample et al. 1998b	0.502	Sample et al. 1998b
Lead	0.055	Sample et al. 1998b	0.041	Sample et al. 1998b	0.148	Sample et al. 1998b
Mercury	0.054	Sample et al. 1998b	0.067	Sample et al. 1998b	0.067	Sample et al. 1998b
Nickel	0.168	Sample et al. 1998b	0.263	Sample et al. 1998b	0.364	Sample et al. 1998b
Selenium	0.258	Sample et al. 1998b	0.273	Sample et al. 1998b	0.273	Sample et al. 1998b
Silver	0.151	Sample et al. 1998b	0.006	Sample et al. 1998b	0.036	Sample et al. 1998b
Tin	--	see text	--	see text	--	see text
Zinc	0.509	Sample et al. 1998b	0.293	Sample et al. 1998b	0.862	Sample et al. 1998b
Semivolatile Organics						
1,2,4-Trichlorobenzene	--	see text	--	see text	--	see text
1,2-Dichlorobenzene	--	see text	--	see text	--	see text
1,3-Dichlorobenzene	--	see text	--	see text	--	see text
1,4-Dichlorobenzene	--	see text	--	see text	--	see text
4-Bromophenyl-phenylether	--	see text	--	see text	--	see text
4-Chlorophenyl-phenylether	--	see text	--	see text	--	see text
Acenaphthene	--	see text	--	see text	--	see text
Acenaphthylene	--	see text	--	see text	--	see text
Anthracene	--	see text	--	see text	--	see text
Benzo(a)anthracene	--	see text	--	see text	--	see text
Benzo(a)pyrene	--	see text	--	see text	--	see text
Benzo(b)fluoranthene	--	see text	--	see text	--	see text
Benzo(g,h,i)perylene	--	see text	--	see text	--	see text
Benzo(k)fluoranthene	--	see text	--	see text	--	see text
Chrysene	--	see text	--	see text	--	see text
Dibenz(a,h)anthracene	--	see text	--	see text	--	see text
Fluoranthene	--	see text	--	see text	--	see text
Fluorene	--	see text	--	see text	--	see text

Table 7-25
Soil Bioaccumulation Factors for Small Mammals - Step 3
Site 28
IHDIV-NSWC

Chemical	Soil-Mouse BAF (dry weight)		Soil-Vole BAF (dry weight)		Soil-Shrew BAF (dry weight)	
	Value	Reference	Value	Reference	Value	Reference
Hexachlorobenzene	--	see text	--	see text	--	see text
Hexachlorobutadiene	--	see text	--	see text	--	see text
Hexachlorocyclopentadiene	--	see text	--	see text	--	see text
Hexachloroethane	--	see text	--	see text	--	see text
Indeno(1,2,3-cd)pyrene	--	see text	--	see text	--	see text
Pentachlorophenol	--	see text	--	see text	--	see text
Phenanthrene	--	see text	--	see text	--	see text
Pyrene	--	see text	--	see text	--	see text
Volatile Organics						
1,1,2,2-Tetrachloroethane	--	see text	--	see text	--	see text

Table 7-26
Sediment Bioaccumulation Factors for Aquatic Plants and Frogs - Step 3
Site 28
IHDIV-NSWC

Chemical	Sediment-Plant BCF (dry weight)		Sediment-Frog BAF (dry weight)	
	Value	Reference	Value	Reference
Inorganics				
Arsenic	0.037	Bechtel Jacobs 1998a	0.126	Pascoe et al. 1996
Cadmium	0.514	Bechtel Jacobs 1998a	0.164	Pascoe et al. 1996
Chromium	0.048	Bechtel Jacobs 1998a	0.038	Krantzberg and Boyd 1992
Copper	0.123	Bechtel Jacobs 1998a	0.100	Krantzberg and Boyd 1992
Lead	0.038	Bechtel Jacobs 1998a	0.070	Krantzberg and Boyd 1992
Mercury	0.344	Bechtel Jacobs 1998a	3.250	Cope et al. 1990
Nickel	0.034	Bechtel Jacobs 1998a	1.000	--
Selenium	0.567	Bechtel Jacobs 1998a	1.000	--
Silver	0.013	Bechtel Jacobs 1998a	1.000	--
Tin	0.030	Baes et al. 1984	1.000	--
Zinc	0.358	Bechtel Jacobs 1998a	0.147	Pascoe et al. 1996
Semivolatile Organics				
1,2,4-Trichlorobenzene	0.1863	Travis and Arms 1988	0.074	Parkerton et al. 1993
1,2-Dichlorobenzene	0.4031	Travis and Arms 1988	0.085	Parkerton et al. 1993
1,3-Dichlorobenzene	0.3673	Travis and Arms 1988	0.085	Parkerton et al. 1993
1,4-Dichlorobenzene	0.4085	Travis and Arms 1988	0.085	Parkerton et al. 1993
4-Bromophenyl-phenylether	0.0499	Travis and Arms 1988	1.000	--
4-Chlorophenyl-phenylether	0.0533	Travis and Arms 1988	1.000	--
Acenaphthene	0.2100	Travis and Arms 1988	1.000	--
Acenaphthylene	0.1653	Travis and Arms 1988	1.000	--
Anthracene	0.0908	Travis and Arms 1988	1.000	--
Benzo(a)anthracene	0.0197	Travis and Arms 1988	1.000	--
Benzo(a)pyrene	0.0114	Travis and Arms 1988	1.000	--
Benzo(b)fluoranthene	0.0101	Travis and Arms 1988	1.000	--
Benzo(g,h,i)perylene	0.0052	Travis and Arms 1988	1.000	--
Benzo(k)fluoranthene	0.0101	Travis and Arms 1988	1.000	--
Chrysene	0.0197	Travis and Arms 1988	1.000	--
Dibenz(a,h)anthracene	0.0053	Travis and Arms 1988	1.000	--
Fluoranthene	0.0425	Travis and Arms 1988	1.000	--
Fluorene	0.1428	Travis and Arms 1988	1.000	--

Table 7-26
Sediment Bioaccumulation Factors for Aquatic Plants and Frogs - Step 3
Site 28
IHDIV-NSWC

Chemical	Sediment-Plant BCF (dry weight)		Sediment-Frog BAF (dry weight)	
	Value	Reference	Value	Reference
Hexachlorobenzene	0.0153	Travis and Arms 1988	0.940	Oliver and Niimi 1988
Hexachlorobutadiene	0.0642	Travis and Arms 1988	0.384	Parkerton et al. 1993
Hexachlorocyclopentadiene	0.0297	Travis and Arms 1988	1.000	--
Hexachloroethane	0.1888	Travis and Arms 1988	1.000	--
Indeno(1,2,3-cd)pyrene	0.0056	Travis and Arms 1988	1.000	--
Pentachlorophenol	0.0443	Travis and Arms 1988	1.000	--
Phenanthrene	0.0908	Travis and Arms 1988	1.000	--
Pyrene	0.0431	Travis and Arms 1988	1.000	--
Volatile Organics				
1,1,2,2-Tetrachloroethane	1.6091	Travis and Arms 1988	1.000	--

Table 7-27
Sediment Bioaccumulation Factors for Benthic Invertebrates and Fish - Step 3
Site 28
IHDIV-NSWC

Chemical	Sediment-Invertebrate BAF (dry weight)		Sediment-Fish BAF (dry weight)	
	Value	Reference	Value	Reference
Inorganics				
Arsenic	0.466	Bechtel Jacobs 1998b	0.126	Pascoe et al. 1996
Cadmium	0.679	Bechtel Jacobs 1998b	0.164	Pascoe et al. 1996
Chromium	0.083	Bechtel Jacobs 1998b	0.038	Krantzberg and Boyd 1992
Copper	0.919	Bechtel Jacobs 1998b	0.100	Krantzberg and Boyd 1992
Lead	0.080	Bechtel Jacobs 1998b	0.070	Krantzberg and Boyd 1992
Mercury	1.077	Bechtel Jacobs 1998b	3.250	Cope et al. 1990
Nickel	0.134	Bechtel Jacobs 1998b	1.000	--
Selenium	1.000	--	1.000	--
Silver	0.180	Hirsch 1998	1.000	--
Tin	1.000	--	1.000	--
Zinc	0.954	Bechtel Jacobs 1998b	0.147	Pascoe et al. 1996
Semivolatile Organics				
1,2,4-Trichlorobenzene	0.260	Oliver and Niimi 1988	0.074	Parkerton et al. 1993
1,2-Dichlorobenzene	1.000	--	0.085	Parkerton et al. 1993
1,3-Dichlorobenzene	1.000	--	0.085	Parkerton et al. 1993
1,4-Dichlorobenzene	1.000	--	0.085	Parkerton et al. 1993
4-Bromophenyl-phenylether	1.000	--	1.000	--
4-Chlorophenyl-phenylether	1.000	--	1.000	--
Acenaphthene	2.040	Maruya et al. 1997	1.000	--
Acenaphthylene	2.040	Acenaphthene value	1.000	--
Anthracene	0.191	Maruya et al. 1997	1.000	--
Benzo(a)anthracene	0.358	Maruya et al. 1997	1.000	--
Benzo(a)pyrene	0.127	Maruya et al. 1997	1.000	--
Benzo(b)fluoranthene	0.150	Maruya et al. 1997	1.000	--
Benzo(g,h,i)perylene	0.215	Maruya et al. 1997	1.000	--
Benzo(k)fluoranthene	0.232	Maruya et al. 1997	1.000	--
Chrysene	0.198	Maruya et al. 1997	1.000	--
Dibenz(a,h)anthracene	0.191	Anthracene value	1.000	--
Fluoranthene	0.212	Maruya et al. 1997	1.000	--
Fluorene	0.481	Maruya et al. 1997	1.000	--

Table 7-27
Sediment Bioaccumulation Factors for Benthic Invertebrates and Fish - Step 3
Site 28
IHDIV-NSWC

Chemical	Sediment-Invertebrate BAF (dry weight)		Sediment-Fish BAF (dry weight)	
	Value	Reference	Value	Reference
Hexachlorobenzene	0.520	Oliver and Niimi 1988	0.940	Oliver and Niimi 1988
Hexachlorobutadiene	0.390	Oliver and Niimi 1988	0.384	Parkerton et al. 1993
Hexachlorocyclopentadiene	1.000	--	1.000	--
Hexachloroethane	1.000	--	1.000	--
Indeno(1,2,3-cd)pyrene	0.173	Maruya et al. 1997	1.000	--
Pentachlorophenol	1.000	--	1.000	--
Phenanthrene	0.294	Maruya et al. 1997	1.000	--
Pyrene	0.435	Maruya et al. 1997	1.000	--
Volatile Organics				
1,1,2,2-Tetrachloroethane	1.000	--	1.000	--

Table 7-28
Surface Soil Screening - Step 3
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient[1]	COPC?
Inorganics (MG/KG)									
Aluminum	28.0 - 98.0	35 / 35	13,100	IS28SS22-0001	5,809	1.00	35 / 35	5,809	**YES**
Antimony	8.40 - 29.0	6 / 19	18.3	IS28SS19-0001	1.72	0.48	6 / 19	3.59	**YES**
Arsenic	1.40 - 4.90	35 / 35	377	IS28SS04-0001	77.9	328	1 / 35	0.24	NO
Barium	28.0 - 98.0	35 / 35	1,550	IS28SS19-0001	153	440	3 / 35	0.35	NO
Beryllium	0.70 - 2.40	3 / 35	2.00	IS28SS22-0001	0.22	0.020	3 / 35	11.0	**YES**
Cadmium	0.70 - 2.40	25 / 35	141	IS28SS19-0001	15.7	2.50	19 / 35	6.28	**YES**
Chromium	1.40 - 4.90	35 / 35	169	IS28SS19-0001	19.3	0.0075	35 / 35	2,567	**YES**
Copper	3.50 - 12.0	35 / 35	1,270	IS28SS19-0001	119	15.0	24 / 35	7.92	**YES**
Iron	14.0 - 49.0	35 / 35	84,600	IS28SS10-0001	19,163	12.0	35 / 35	1,597	**YES**
Lead	0.43 - 31.0	35 / 35	10,300	IS28SS19-0001	794	0.010	35 / 35	79,388	**YES**
Manganese	2.10 - 7.30	35 / 35	711	IS28SS10-0001	205	330	9 / 35	0.62	NO
Mercury	0.077 - 0.42	16 / 35	11.5	IS28SS15-0001	0.55	0.058	16 / 35	9.50	**YES**
Nickel	5.60 - 20.0	26 / 35	44.1	IS28SS19-0001	10.6	2.00	26 / 35	5.30	**YES**
Silver	1.40 - 4.90	10 / 35	16.1	IS28SS10-0001	1.72	9.80E-06	10 / 35	175,641	**YES**
Thallium	1.40 - 4.90	0 / 35	--	--	0.40	0.0010	-- / --	405	(YES)
Vanadium	7.00 - 24.0	35 / 35	70.4	IS28SS10-0001	23.5	0.50	35 / 35	47.0	**YES**
Zinc	2.90 - 390	35 / 35	71,900	IS28SS08-0001	9,594	10.0	35 / 35	959	**YES**
Semivolatile Organic Compounds (UG/KG)									
2,4,5-Trichlorophenol	930 - 6,000	1 / 35	130	IS28SS36-0001	706	100	1 / 35	1.30	**YES**
2,4,6-Trichlorophenol	370 - 2,400	1 / 35	100	IS28SS36-0001	283	100	1 / 35	1.00	**YES**
2,4-Dichlorophenol	370 - 2,400	1 / 35	100	IS28SS36-0001	283	100	1 / 35	1.00	**YES**
2,4-Dinitrophenol	930 - 6,000	0 / 35	--	--	715	100	-- / --	7.15	(YES)
2,4-Dinitrotoluene	370 - 2,400	3 / 35	1,200	IS28SS10-0001	309	NSV	-- / --	NSV	**YES**
2,6-Dinitrotoluene	370 - 2,400	1 / 35	110	IS28SS36-0001	283	NSV	-- / --	NSV	**YES**
2-Chloronaphthalene	370 - 2,400	1 / 35	110	IS28SS36-0001	283	NSV	-- / --	NSV	**YES**
2-Chlorophenol	370 - 2,400	1 / 35	100	IS28SS36-0001	283	100	1 / 35	1.00	**YES**
2-Methylnaphthalene	370 - 2,400	1 / 35	150	IS28SS36-0001	284	NSV	-- / --	NSV	**YES**
2-Nitroaniline	930 - 6,000	1 / 35	64.0	IS28SS36-0001	704	NSV	-- / --	NSV	**YES**

NSV - No Screening Value
1 - Shaded cells: HQ based on reporting limits; '--' indicates chemical was not detected and reporting limits were not available

Table 7-28
Surface Soil Screening - Step 3
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient[1]	COPC?
2-Nitrophenol	370 - 2,400	1 / 35	100	IS28SS36-0001	283	NSV	-- / --	NSV	YES
4,6-Dinitro-2-methylphenol	930 - 6,000	1 / 35	98.0	IS28SS36-0001	705	NSV	-- / --	NSV	YES
4-Bromophenyl-phenylether	370 - 2,400	1 / 35	120	IS28SS36-0001	283	NSV	-- / --	NSV	YES
4-Chloro-3-methylphenol	370 - 2,400	1 / 35	82.0	IS28SS36-0001	282	NSV	-- / --	NSV	YES
4-Chlorophenyl-phenylether	370 - 2,400	1 / 35	120	IS28SS36-0001	283	NSV	-- / --	NSV	YES
4-Nitrophenol	930 - 6,000	0 / 35	--	--	715	100	-- / --	7.15	(YES)
Acenaphthene	370 - 2,400	2 / 35	130	IS28SS36-0001	279	100	1 / 35	1.30	YES
Acenaphthylene	370 - 2,400	4 / 35	120	IS28SS36-0001	268	100	1 / 35	1.20	YES
Acetophenone	370 - 2,400	1 / 35	100	IS28SS36-0001	283	NSV	-- / --	NSV	YES
Anthracene	370 - 2,400	4 / 35	120	IS28SS36-0001	266	100	1 / 35	1.20	YES
Atrazine	370 - 2,400	1 / 35	100	IS28SS36-0001	283	NSV	-- / --	NSV	YES
Benzaldehyde	370 - 2,400	1 / 35	150	IS28SS36-0001	284	NSV	-- / --	NSV	YES
Benzo(a)anthracene	370 - 2,400	20 / 35	540	IS28SS15-0001	188	100	10 / 35	1.88	YES
Benzo(a)pyrene	370 - 2,400	18 / 35	810	IS28SS15-0001	207	100	10 / 35	2.07	YES
Benzo(b)fluoranthene	370 - 2,400	23 / 35	1,700	IS28SS15-0001	235	100	11 / 35	2.35	YES
Benzo(g,h,i)perylene	370 - 2,400	9 / 35	540	IS28SS42-0001	238	100	4 / 35	2.38	YES
Benzo(k)fluoranthene	370 - 2,400	16 / 35	660	IS28SS15-0001	205	100	6 / 35	2.05	YES
Bis(2-chloro-1-methylethyl) ether	370 - 2,400	1 / 35	100	IS28SS36-0001	283	NSV	-- / --	NSV	YES
Butylbenzylphthalate	370 - 2,400	5 / 35	340	IS28SS06-0001	277	NSV	-- / --	NSV	YES
Caprolactam	370 - 2,400	1 / 35	86.0	IS28SS36-0001	282	NSV	-- / --	NSV	YES
Carbazole	370 - 2,400	3 / 35	140	IS28SS36-0001	274	NSV	-- / --	NSV	YES
Chrysene	370 - 2,400	22 / 35	620	IS28SS15-0001	193	100	10 / 35	1.93	YES
Di-n-octylphthalate	370 - 2,400	1 / 35	120	IS28SS36-0001	283	NSV	-- / --	NSV	YES
Dibenz(a,h)anthracene	370 - 2,400	8 / 35	500	IS28SS42-0001	242	100	3 / 35	2.42	YES
Dibenzofuran	370 - 2,400	2 / 35	120	IS28SS36-0001	279	NSV	-- / --	NSV	YES
Fluoranthene	370 - 2,400	26 / 35	850	IS28SS17-0001	196	100	13 / 35	1.96	YES
Fluorene	370 - 2,400	1 / 35	120	IS28SS36-0001	283	100	1 / 35	1.20	YES
Hexachlorobutadiene	370 - 2,400	1 / 35	120	IS28SS36-0001	283	NSV	-- / --	NSV	YES
Hexachloroethane	370 - 2,400	1 / 35	95.0	IS28SS36-0001	283	NSV	-- / --	NSV	YES

NSV - No Screening Value
1 - Shaded cells: HQ based on reporting limits; '--' indicates chemical was not detected and reporting limits were not available

Table 7-28
Surface Soil Screening - Step 3
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient[1]	COPC?
Indeno(1,2,3-cd)pyrene	370 - 2,400	17 / 35	1,100	IS28SS15-0001	227	100	8 / 35	2.27	**YES**
Isophorone	370 - 2,400	1 / 35	110	IS28SS36-0001	283	NSV	-- / --	NSV	**YES**
Naphthalene	370 - 2,400	1 / 35	110	IS28SS36-0001	283	100	1 / 35	1.10	**YES**
Pentachlorophenol	930 - 6,000	1 / 35	130	IS28SS36-0001	706	100	1 / 35	1.30	**YES**
Phenanthrene	370 - 2,400	16 / 35	740	IS28SS17-0001	193	100	4 / 35	1.93	**YES**
Phenol	370 - 2,400	1 / 35	100	IS28SS36-0001	283	100	1 / 35	1.00	**YES**
Pyrene	370 - 2,400	26 / 35	550	IS28SS17-0001	185	100	12 / 35	1.85	**YES**
bis(2-Chloroethoxy)methane	370 - 2,400	1 / 35	110	IS28SS36-0001	283	NSV	-- / --	NSV	**YES**
bis(2-Chloroethyl)ether	370 - 2,400	1 / 35	110	IS28SS36-0001	283	NSV	-- / --	NSV	**YES**
bis(2-Ethylhexyl)phthalate	370 - 2,400	7 / 35	330	IS28SS21-0001	163	NSV	-- / --	NSV	**YES**
n-Nitroso-di-n-propylamine	370 - 2,400	1 / 35	100	IS28SS36-0001	283	NSV	-- / --	NSV	**YES**
Explosives (UG/KG)									
1,3,5-Trinitrobenzene	100 - 100	1 / 35	670	IS28SS11-0001	67.7	NSV	-- / --	NSV	**YES**
2,4,6-Trinitrotoluene	100 - 100	4 / 35	450	IS28SS24-0001	78.6	NSV	-- / --	NSV	**YES**
2,4-Dinitrotoluene	100 - 100	4 / 35	230	IS28SS24-0001	63.1	NSV	-- / --	NSV	**YES**
HMX	200 - 200	1 / 35	230	IS28SS37-0001	104	NSV	-- / --	NSV	**YES**
Tetryl	200 - 200	2 / 35	620	IS28SS24-0001	116	NSV	-- / --	NSV	**YES**
Volatile Organic Compounds (UG/KG)									
1,2-Dichloroethene (total)	10.0 - 23.0	8 / 15	3.00	IS28SS33-0001	2.47	NSV	-- / --	NSV	**YES**
Cumene	10.0 - 23.0	1 / 35	7.00	IS28SS41-0001	6.90	NSV	-- / --	NSV	**YES**
Methyl acetate	10.0 - 23.0	1 / 35	6.00	IS28SS37-0001	7.04	NSV	-- / --	NSV	**YES**
Methyl-tert-butyl ether (MTBE)	10.0 - 23.0	19 / 35	11.0	IS28SS33-0001	4.58	NSV	-- / --	NSV	**YES**
m- and p-Xylene	10.0 - 23.0	1 / 15	2.00	IS28SS21-0001	7.53	NSV	-- / --	NSV	**YES**

NSV - No Screening Value
1 - Shaded cells: HQ based on reporting limits; '--' indicates chemical was not detected and reporting limits were not available

Table 7-29
Onsite Sediment Screening Statistics - Step 3
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient[1]	COPC?
Inorganics (MG/KG)									
Arsenic	2.20 - 5.00	7 / 8	220	IS28SD02-0503	49.2	8.20	7 / 8	6.00	**YES**
Barium	44.0 - 99.0	8 / 8	166	IS28SD02-0503	53.7	NSV	-- / --	NSV	**YES**
Beryllium	1.10 - 2.50	2 / 8	0.26	IS28SD020006	0.19	NSV	-- / --	NSV	**YES**
Cadmium	1.10 - 2.50	6 / 8	28.0	IS28SD02-0503	9.44	1.20	6 / 8	7.87	**YES**
Chromium	2.20 - 5.00	8 / 8	18.3	IS28SD02-0503	10.7	5.00	7 / 8	2.14	**YES**
Cobalt	11.0 - 25.0	8 / 8	11.7	IS28SD02-0503	5.13	NSV	-- / --	NSV	**YES**
Copper	5.40 - 12.0	7 / 8	111	IS28SD02-0503	55.8	34.0	6 / 8	1.64	**YES**
Lead	0.66 - 15.0	8 / 8	827	IS28SD02-0503	372	46.7	6 / 8	7.96	**YES**
Mercury	0.085 - 0.35	2 / 8	0.48	IS28SD02-0503	0.14	0.15	2 / 8	0.91	NO
Nickel	8.70 - 20.0	8 / 8	44.4	IS28SD01-0503	13.2	20.9	1 / 8	0.63	NO
Selenium	1.10 - 2.50	5 / 8	2.00	IS28SD02-0503	0.72	NSV	-- / --	NSV	**YES**
Silver	2.20 - 5.00	2 / 8	1.10	IS28SD01-0503	0.81	1.00	2 / 8	0.81	NO
Vanadium	11.0 - 25.0	7 / 8	39.3	IS28SD02-0503	13.7	NSV	-- / --	NSV	**YES**
Zinc	4.40 - 99.0	8 / 8	14,200	IS28SD02-0503	5,762	150	6 / 8	38.4	**YES**
Semivolatile Organic Compounds (UG/KG)									
2,4-Dimethylphenol	450 - 1,200	0 / 4	--	--	336	29.0	-- / --	11.6	(YES)
2,4-Dinitrotoluene	450 - 1,200	1 / 4	820	IS28SD02-0503	391	NSV	-- / --	NSV	**YES**
2-Methylnaphthalene	450 - 1,200	0 / 4	--	--	336	70.0	-- / --	4.80	(YES)
2-Methylphenol	450 - 1,200	0 / 4	--	--	336	63.0	-- / --	5.34	(YES)
4-Methylphenol	450 - 1,200	0 / 4	--	--	336	670	-- / --	0.50	NO
Acenaphthene	450 - 1,200	0 / 4	--	--	336	16.0	-- / --	21.0	(YES)
Acenaphthylene	450 - 1,200	0 / 4	--	--	336	44.0	-- / --	7.64	(YES)
Anthracene	450 - 1,200	0 / 4	--	--	336	85.3	-- / --	3.94	(YES)
Dibenz(a,h)anthracene	450 - 1,200	0 / 4	--	--	336	63.4	-- / --	5.30	(YES)
Dibenzofuran	450 - 1,200	0 / 4	--	--	336	540	-- / --	0.62	NO
Diethylphthalate	450 - 1,200	0 / 4	--	--	336	200	-- / --	1.68	(YES)
Dimethyl phthalate	450 - 1,200	0 / 4	--	--	336	71.0	-- / --	4.74	(YES)
Fluorene	450 - 1,200	0 / 4	--	--	336	19.0	-- / --	17.7	(YES)

NSV - No Screening Value
1 - Shaded cells: HQ based on reporting limits; '--' indicates chemical was not detected and reporting limits were not available

Table 7-29
Onsite Sediment Screening Statistics - Step 3
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient[1]	COPC?
Hexachlorobenzene	450 - 1,200	0 / 4	--	--	336	22.0	-- / --	15.3	(YES)
Hexachlorobutadiene	450 - 1,200	0 / 4	--	--	336	11.0	-- / --	30.6	(YES)
Naphthalene	450 - 1,200	0 / 4	--	--	336	160	-- / --	2.10	(YES)
Pentachlorophenol	1,100 - 3,200	0 / 4	--	--	875	360	-- / --	2.43	(YES)
Phenol	450 - 1,200	0 / 4	--	--	336	420	-- / --	0.80	NO
n-Nitrosodiphenylamine	450 - 1,200	1 / 4	220	IS28SD02-0503	241	28.0	1 / 4	7.86	**YES**
Explosives (UG/KG)									
2,4-Dinitrotoluene	100 - 100	1 / 4	130	IS28SD02-0503	70.0	NSV	-- / --	NSV	**YES**
2-Amino-4,6-dinitrotoluene	100 - 100	1 / 4	59.0	IS28SD02-0503	52.3	NSV	-- / --	NSV	**YES**
4-Amino-2,6-dinitrotoluene	100 - 100	1 / 4	110	IS28SD02-0503	65.0	NSV	-- / --	NSV	**YES**
Nitroglycerin	6,000 - 13,000	1 / 4	25,000	IS28SD02-0503	8,638	NSV	-- / --	NSV	**YES**
Volatile Organic Compounds (UG/KG)									
1,1,1-Trichloroethane	13.0 - 34.0	0 / 3	--	--	10.2	31.0	-- / --	0.33	NO
1,1,2-Trichloroethane	13.0 - 34.0	0 / 3	--	--	10.2	31.0	-- / --	0.33	NO
1,2-Dichloroethene (total)	13.0 - 34.0	2 / 3	3.00	IS28SD02-0503	2.00	NSV	-- / --	NSV	**YES**
Acetone	13.0 - 34.0	1 / 3	3.00	IS28SD03-0503	8.83	NSV	-- / --	NSV	**YES**
Ethylbenzene	13.0 - 34.0	0 / 3	--	--	10.2	10.0	-- / --	1.02	(YES)
Methyl-tert-butyl ether (MTBE)	13.0 - 34.0	1 / 3	5.00	IS28SD03-0503	9.67	NSV	-- / --	NSV	**YES**
cis-1,2-Dichloroethene	13.0 - 34.0	3 / 3	3.00	IS28SD02-0503	2.00	NSV	-- / --	NSV	**YES**

NSV - No Screening Value
1 - Shaded cells: HQ based on reporting limits; '--' indicates chemical was not detected and reporting limits were not available

Table 7-30
Surface Water Screening - Step 3
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient[1]	COPC?
Inorganics (UG/L)									
Aluminum	200 - 200	0 / 3	--	--	44.3	25.0	-- / --	1.77	(YES)
Antimony	60.0 - 60.0	0 / 3	--	--	0.67	30.0	-- / --	0.022	NO
Cadmium	5.00 - 5.00	3 / 3	7.60	IS28SW03-0503	7.07	0.090	3 / 3	78.5	**YES**
Copper	25.0 - 25.0	1 / 3	16.6	IS28SW03-0503	9.98	2.70	1 / 3	3.70	**YES**
Iron	100 - 100	2 / 3	6,600	IS28SW02-0503	2,275	1,000	1 / 3	2.28	**YES**
Lead	3.00 - 3.00	1 / 3	61.5	IS28SW02-0503	21.8	0.54	1 / 3	40.4	**YES**
Selenium	5.00 - 5.00	0 / 3	--	--	1.05	5.00	-- / --	0.21	NO
Silver	10.0 - 10.0	0 / 3	--	--	2.39	1.00E-04	-- / --	23,900	(YES)
Zinc	20.0 - 20.0	3 / 3	4,140	IS28SW02-0503	3,643	36.5	3 / 3	99.8	**YES**
Dissolved Metals (UG/L)									
Aluminum	200 - 200	0 / 3	--	--	14.1	25.0	-- / --	0.57	NO
Antimony	60.0 - 60.0	0 / 3	--	--	0.67	30.0	-- / --	0.022	NO
Cadmium	5.00 - 5.00	3 / 3	7.40	IS28SW02-0503	6.37	0.090	3 / 3	70.7	**YES**
Copper	25.0 - 25.0	0 / 3	--	--	2.31	2.70	-- / --	0.86	NO
Lead	3.00 - 3.00	0 / 3	--	--	0.70	0.54	-- / --	1.30	(YES)
Selenium	5.00 - 5.00	0 / 3	--	--	1.05	5.00	-- / --	0.21	NO
Silver	10.0 - 10.0	0 / 3	--	--	2.39	1.00E-04	-- / --	23,900	(YES)
Zinc	20.0 - 20.0	3 / 3	4,420	IS28SW02-0503	3,687	36.5	3 / 3	101	**YES**
Semivolatile Organic Compounds (UG/L)									
4-Bromophenyl-phenylether	10.0 - 10.0	0 / 3	--	--	5.00	1.50	-- / --	3.33	(YES)
Anthracene	10.0 - 10.0	0 / 3	--	--	5.00	0.10	-- / --	50.0	(YES)
Benzo(a)anthracene	10.0 - 10.0	0 / 3	--	--	5.00	6.30	-- / --	0.79	NO
Benzo(a)pyrene	10.0 - 10.0	0 / 3	--	--	5.00	0.014	-- / --	357	(YES)
Butylbenzylphthalate	10.0 - 10.0	0 / 3	--	--	5.00	3.00	-- / --	1.67	(YES)
Di-n-butylphthalate	10.0 - 10.0	0 / 3	--	--	5.00	0.30	-- / --	16.7	(YES)
Di-n-octylphthalate	10.0 - 10.0	0 / 3	--	--	5.00	0.30	-- / --	16.7	(YES)
Dibenzofuran	10.0 - 10.0	0 / 3	--	--	5.00	3.70	-- / --	1.35	(YES)
Diethylphthalate	10.0 - 10.0	0 / 3	--	--	5.00	3.00	-- / --	1.67	(YES)

NSV - No Screening Value
1 - Shaded cells: HQ based on reporting limits; '--' indicates chemical was not detected and reporting limits were not available

Table 7-30
Surface Water Screening - Step 3
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient[1]	COPC?
Dimethyl phthalate	10.0 - 10.0	0 / 3	--	--	5.00	3.00	-- / --	1.67	(YES)
Hexachlorobenzene	10.0 - 10.0	0 / 3	--	--	5.00	3.68	-- / --	1.36	(YES)
Hexachlorobutadiene	10.0 - 10.0	0 / 3	--	--	5.00	9.30	-- / --	0.54	NO
Hexachlorocyclopentadiene	10.0 - 10.0	0 / 3	--	--	5.00	5.20	-- / --	0.96	NO
Pentachlorophenol	25.0 - 25.0	0 / 3	--	--	12.5	15.0	-- / --	0.83	NO
Phenanthrene	10.0 - 10.0	0 / 3	--	--	5.00	6.30	-- / --	0.79	NO
Explosives (UG/L)									
Volatile Organic Compounds (UG/L)									
Carbon disulfide	10.0 - 10.0	0 / 3	--	--	5.00	2.00	-- / --	2.50	(YES)

NSV - No Screening Value
1 - Shaded cells: HQ based on reporting limits; '--' indicates chemical was not detected and reporting limits were not available

Table 7-31
Mattawoman Creek Sediment Screening - Step 3
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient[1]	COPC?
Inorganics (MG/KG)									
Arsenic	1.70 - 5.30	7 / 10	8.20	IS28SD110006	4.00	8.20	1 / 10	0.49	NO
Barium	34.0 - 110	10 / 10	134	IS28SD120006	67.9	NSV	-- / --	NSV	**YES**
Beryllium	0.84 - 2.60	9 / 10	1.00	IS28SD120006	0.60	NSV	-- / --	NSV	**YES**
Cadmium	0.84 - 2.60	0 / 10	--	--	0.53	1.20	-- / --	0.45	NO
Chromium	1.70 - 5.30	10 / 10	27.8	IS28SD120006	15.6	5.00	9 / 10	3.13	**YES**
Cobalt	8.40 - 26.0	10 / 10	13.2	IS28SD130006	8.82	NSV	-- / --	NSV	**YES**
Mercury	0.073 - 0.29	1 / 10	0.44	IS28SD110006	0.11	0.15	1 / 10	0.73	NO
Nickel	6.80 - 21.0	10 / 10	20.9	IS28SD120006	11.0	20.9	1 / 10	0.53	NO
Selenium	0.84 - 2.60	1 / 10	0.85	IS28SD100006	0.42	NSV	-- / --	NSV	**YES**
Silver	1.70 - 5.30	9 / 10	4.00	IS28SD110006	2.07	1.00	8 / 10	2.07	**YES**
Vanadium	8.40 - 26.0	10 / 10	38.2	IS28SD120006	24.8	NSV	-- / --	NSV	**YES**
Zinc	3.40 - 11.0	10 / 10	159	IS28SD110006	62.3	150	1 / 10	0.42	NO
Semivolatile Organic Compounds (UG/KG)									
2,4-Dimethylphenol	400 - 1,000	0 / 2	--	--	350	29.0	-- / --	12.1	(YES)
2-Methylnaphthalene	400 - 1,000	0 / 2	--	--	350	70.0	-- / --	5.00	(YES)
2-Methylphenol	400 - 1,000	0 / 2	--	--	350	63.0	-- / --	5.56	(YES)
4-Methylphenol	400 - 1,000	0 / 2	--	--	350	670	-- / --	0.52	NO
Acenaphthene	400 - 1,000	0 / 2	--	--	350	16.0	-- / --	21.9	(YES)
Acenaphthylene	400 - 1,000	0 / 2	--	--	350	44.0	-- / --	7.95	(YES)
Anthracene	400 - 1,000	0 / 2	--	--	350	85.3	-- / --	4.10	(YES)
Benzaldehyde	400 - 1,000	1 / 2	160	IS28SD110006	180	NSV	-- / --	NSV	**YES**
Benzo(a)anthracene	400 - 1,000	0 / 2	--	--	350	261	-- / --	1.34	(YES)
Benzo(a)pyrene	400 - 1,000	0 / 2	--	--	350	430	-- / --	0.81	NO
Benzo(g,h,i)perylene	400 - 1,000	0 / 2	--	--	350	670	-- / --	0.52	NO
Benzo(k)fluoranthene	400 - 1,000	0 / 2	--	--	350	240	-- / --	1.46	(YES)
Butylbenzylphthalate	400 - 1,000	0 / 2	--	--	350	63.0	-- / --	5.56	(YES)
Dibenz(a,h)anthracene	400 - 1,000	0 / 2	--	--	350	63.4	-- / --	5.52	(YES)
Dibenzofuran	400 - 1,000	0 / 2	--	--	350	540	-- / --	0.65	NO

NSV - No Screening Value
1 - Shaded cells: HQ based on reporting limits; '--' indicates chemical was not detected and reporting limits were not available

Table 7-31
Mattawoman Creek Sediment Screening - Step 3
Site 28
IHDIV-NSWC

Chemical	Reporting Limit Range	Frequency of Detection	Maximum Concentration Detected	Sample ID of Maximum Concentration	Arithmetic Mean	Screening Value	Frequency of Exceedance	Mean Hazard Quotient[1]	COPC?
Dimethyl phthalate	400 - 1,000	0 / 2	--	--	350	71.0	-- / --	4.93	(YES)
Fluorene	400 - 1,000	0 / 2	--	--	350	19.0	-- / --	18.4	(YES)
Hexachlorobenzene	400 - 1,000	0 / 2	--	--	350	22.0	-- / --	15.9	(YES)
Hexachlorobutadiene	400 - 1,000	0 / 2	--	--	350	11.0	-- / --	31.8	(YES)
Indeno(1,2,3-cd)pyrene	400 - 1,000	0 / 2	--	--	350	600	-- / --	0.58	NO
Naphthalene	400 - 1,000	0 / 2	--	--	350	160	-- / --	2.19	(YES)
Pentachlorophenol	1,000 - 2,500	0 / 2	--	--	875	360	-- / --	2.43	(YES)
Phenanthrene	400 - 1,000	0 / 2	--	--	350	240	-- / --	1.46	(YES)
Phenol	400 - 1,000	0 / 2	--	--	350	420	-- / --	0.83	NO
n-Nitrosodiphenylamine	400 - 1,000	1 / 2	79.0	IS28SD110006	140	28.0	1 / 2	2.82	**YES**
Explosives (UG/KG)									

NSV - No Screening Value
1 - Shaded cells: HQ based on reporting limits; '--' indicates chemical was not detected and reporting limits were not available

Ta. -32

Summary of Hazard Quotients for Onsite Food Web Exposures - Step 3

Site 28

IHDIV-NSWC

Chemical	Short-tailed shrew		Meadow vole		Mink		Gray fox		Muskrat	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics										
Arsenic	11.83	2.37	3.25	0.65	0.26	0.05	0.39	0.08	2.33	0.47
Cadmium	10.55	1.06	2.00	0.20	0.35	0.07	2.08	0.42	0.96	0.10
Chromium	0.22	0.04	0.04	<0.01	<0.01	<0.01	0.04	<0.01	0.03	<0.01
Copper	0.10	0.07	0.04	0.03	0.05	0.04	0.20	0.16	0.02	0.01
Lead	3.98	0.40	0.89	0.09	0.19	0.02	0.80	0.08	0.57	0.06
Mercury	2.03	0.41	0.61	0.12	0.10	0.06	0.07	0.04	0.23	0.05
Nickel	0.08	0.04	0.04	0.02	0.03	0.01	0.03	0.01	0.02	<0.01
Selenium	1.36	0.82	1.16	0.71	0.27	0.16	0.50	0.30	0.62	0.38
Silver	0.09	0.02	0.06	0.01	0.01	<0.01	0.02	<0.01	0.03	<0.01
Zinc	16.70	8.35	6.00	3.00	6.68	1.34	30.22	6.04	2.99	1.49
Semivolatile Organics										
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorobenzene	0.04	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorobutadiene	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorocyclopentadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Table 7-32
Summary of Hazard Quotients for Onsite Food Web Exposures - Step 3
Site 28
IHDIV-NSWC

Chemical	Short-tailed shrew		Meadow vole		Mink		Gray fox		Muskrat	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Indeno(1,2,3-cd)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pentachlorophenol	0.06	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Volatile Organics										
1,1,2,2-Tetrachloroethane	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

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Summary of Hazard Quotients for Onsite Food Web Exposures - Step 3
Site 28
IHDIV-NSWC

Chemical	American robin		Mourning dove		Eastern screech-owl		Great blue heron		Mallard	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Inorganics										
Arsenic	0.55	0.18	0.45	0.15	0.43	0.14	0.24	0.09	0.09	0.04
Cadmium	3.49	0.25	1.27	0.09	3.64	0.26	0.41	0.03	0.47	0.03
Chromium	0.33	0.07	0.25	0.05	0.38	0.08	0.08	0.02	0.06	0.01
Copper	0.09	0.07	0.08	0.06	0.11	0.08	0.03	0.02	0.03	0.02
Lead	3.71	0.74	9.47	0.95	4.13	0.83	1.45	0.29	2.41	0.24
Mercury	0.07	0.03	0.07	0.03	0.06	0.02	3.08	1.03	0.22	0.07
Nickel	0.02	0.01	0.01	<0.01	0.02	0.01	0.03	0.02	<0.01	<0.01
Selenium	0.38	0.11	0.35	0.10	0.30	0.09	0.10	0.02	0.21	0.10
Silver	0.06	0.01	0.04	<0.01	0.05	0.01	<0.01	<0.01	<0.01	<0.01
Zinc	96.50	10.68	60.22	6.67	103.17	11.42	21.67	2.40	23.63	2.62
Semivolatile Organics										
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Acenaphthylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(a)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(b)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Benzo(k)fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chrysene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Dibenz(a,h)anthracene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluoranthene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Fluorene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorobenzene	0.15	0.03	0.02	<0.01	0.17	0.03	0.50	0.10	0.02	<0.01
Hexachlorobutadiene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 7-32
Summary of Hazard Quotients for Onsite Food Web Exposures - Step 3
Site 28
IHDIV-NSWC

Chemical	American robin		Mourning dove		Eastern screech-owl		Great blue heron		Mallard	
	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL	NOAEL	LOAEL
Indeno(1,2,3-cd)pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pentachlorophenol	0.03	0.01	<0.01	<0.01	0.03	0.02	0.04	0.02	<0.01	<0.01
Phenanthrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Pyrene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Volatile Organics										
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

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Summary of Hazard Quotients for Onsite Food Web Exposures - Step 3

Site 28

IHDIV-NSWC

Chemical	Tree swallow	
	NOAEL	LOAEL
Inorganics		
Arsenic	0.60	0.20
Cadmium	1.92	0.14
Chromium	0.15	0.03
Copper	0.09	0.07
Lead	2.04	0.41
Mercury	0.04	0.02
Nickel	0.02	0.02
Selenium	0.57	0.17
Silver	0.08	0.02
Zinc	81.13	8.98
Semivolatile Organics		
1,2,4-Trichlorobenzene	<0.01	<0.01
1,2-Dichlorobenzene	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01
4-Bromophenyl-phenylether	NA	NA
4-Chlorophenyl-phenylether	NA	NA
Acenaphthene	<0.01	<0.01
Acenaphthylene	<0.01	<0.01
Anthracene	<0.01	<0.01
Benzo(a)anthracene	<0.01	<0.01
Benzo(a)pyrene	<0.01	<0.01
Benzo(b)fluoranthene	<0.01	<0.01
Benzo(g,h,i)perylene	<0.01	<0.01
Benzo(k)fluoranthene	<0.01	<0.01
Chrysene	<0.01	<0.01
Dibenz(a,h)anthracene	<0.01	<0.01
Fluoranthene	<0.01	<0.01
Fluorene	<0.01	<0.01
Hexachlorobenzene	0.09	0.02
Hexachlorobutadiene	<0.01	<0.01
Hexachlorocyclopentadiene	NA	NA
Hexachloroethane	NA	NA

Table 7-32
Summary of Hazard Quotients for Onsite Food Web Exposures - Step 3
Site 28
IHDIV-NSWC

Chemical	Tree swallow	
	NOAEL	LOAEL
Indeno(1,2,3-cd)pyrene	<0.01	<0.01
Pentachlorophenol	0.01	<0.01
Phenanthrene	<0.01	<0.01
Pyrene	<0.01	<0.01
Volatile Organics		
1,1,2,2-Tetrachloroethane	NA	NA
1,2,4-Trichlorobenzene	<0.01	<0.01
1,2-Dichlorobenzene	<0.01	<0.01
1,3-Dichlorobenzene	<0.01	<0.01
1,4-Dichlorobenzene	<0.01	<0.01

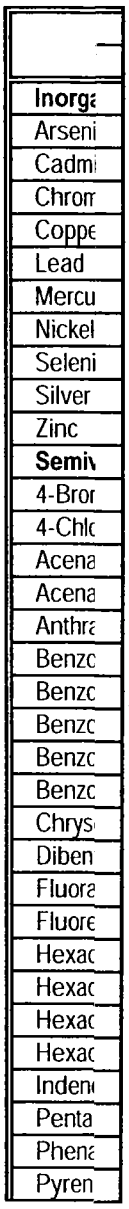
Inorg
Arseni
Cadm
Chrom
Coppe
Lead
Mercu
Nickel
Seleni
Silver
Zinc
Semi
4-Bror
4-Chlc
Acena
Acena
Anthra
Benzc
Benzc
Benzc
Benzc
Benzc
Chrys
Diben
Fluora
Fluore
Hexac
Hexac
Hexac
Hexac
Indeno
Penta
Phena
Pyren

Table 7-34
Summary of Risk-Driving COCs
Site 28
IHDIV-NSWC

Chemical	SS COC?	Onsite SD COC?	SW COC?	Mattawoman Creek COC?	Site Food Web COC?	MCFood Web COC?
Inorganics						
Aluminum	NO	NO	YES	NO	NO	NO
Antimony	YES	NO	NO	NO	NO	NO
Arsenic	NO	YES	NO	NO	YES	NO
Barium	NO	NO	NO	NO	NO	NO
Beryllium	NO	NO	NO	NO	NO	NO
Cadmium	YES	YES	YES	NO	YES	NO
Chromium	NO	NO	NO	NO	NO	NO
Cobalt	NO	NO	NO	NO	NO	NO
Copper	YES	YES	NO	NO	NO	NO
Iron	NO	NO	YES	NO	NO	NO
Lead	YES	YES	YES	NO	YES	NO
Manganese	NO	NO	NO	NO	NO	NO
Mercury	YES	NO	NO	NO	YES	NO
Nickel	YES	NO	NO	NO	NO	NO
Selenium	NO	NO	NO	NO	YES	NO
Silver	YES	NO	YES	YES	NO	NO
Thallium	NO	NO	NO	NO	NO	NO
Vanadium	NO	NO	NO	NO	NO	NO
Zinc	YES	YES	YES	NO	YES	NO

NSV - No Screening Value
1 - Shaded cells indicate hazard quotient based on reporting limits
2 - Macronutrient - Not considered to be a COPC

SECTION 8

Conclusions and Recommendations

The objectives of the RI, presented in the work plan (CH2M HILL, 2003), were to:

- Verify the presence of contamination in soil, groundwater, surface water, and sediment resulting from past activities at the site
- Define the extent of contamination
- Evaluate the need for remediation based on the information developed in the human health and ecological risk assessments

8.1 Conclusions

The analytical results have adequately defined the nature and extent of the contamination for each medium. The number of samples taken was adequate to determine concentration trends at the site. None of the media contain VOCs, SVOCs, or chemicals used in explosive devices in significant quantities to be of concern. All risk drivers at the site are metals.

The human health risk assessment determined that potentially unacceptable risk was present for future adults, children, lifetime residents, and construction workers exposed to soil and groundwater at Site 28. Risks to commercial and industrial workers from soil were not quantitatively evaluated in the risk assessment. However, based on the calculated risk to an adult resident exposed to soil (i.e., a noncarcinogenic hazard that only marginally exceeded the USEPA target hazard level), which is the most directly analogous receptor to a commercial worker, the potential risk to this receptor is likely acceptable. The analysis of the elevated lead concentrations in the Swale 3 area (Figure 6-2) concluded that exposure to surface and subsurface soil in this area would potentially be a concern for fetuses of expectant construction workers, utility workers (if they are exposed at the upper end of the estimated range of parameter values), and adult trespassers (if they are exposed at the upper end of the estimated range of parameter values), and for future child residents. None of these receptors are present at the site, nor are they expected to be present at the site in the future.

The SERA determined that potentially unacceptable risk was present in the soil and sediment. A BERA is already funded, and is currently underway to address potential ecological risks.

8.2 Recommendations

The recommendation for metals-contaminated soil in the Swale 3 area at Site 28 is to evaluate soil removal as an IRM. This IRM will include removal of soil to a depth and extent that will mitigate the potential risks to both human and ecological receptors from soil at Site 28. The BERA will evaluate the potential ecological risks from sediment, surface water, and groundwater-to-surface water exposure at Site 28. Based on the results of the BERA, these pathways may need to be addressed in a Feasibility Study.

While risks from groundwater to human receptors are estimated to be potentially unacceptable, groundwater is not recommended for advancement in the CERCLA process to the feasibility study stage. Given the proximity of Site 28 to Mattawoman Creek, low hydraulic conductivity, and the very thin saturated thickness, shallow groundwater in the vicinity of Site 28 is not a potable resource. One could not build a legal well in this unit, given Maryland well construction regulations that require a minimum of 20 feet of isolation casing from ground surface. This unit is also not capable of meeting sustained yield requirements of Maryland well construction regulations; a well casing greater than 200 feet would likely be required.

Risk from groundwater to ecological receptors will be evaluated in the Site 28 BERA because groundwater does migrate to surface water swales and the Mattawoman Creek system. Groundwater is also a potential source of metals to the near-shore sediments and surface water and thus will be considered in the management of ecological risk for these media. The BERA will be completed prior to the Site 28 Feasibility Study.

Also, shoreline habitat is expected to be restored as part of any remedial action, as the current conditions are degraded and active erosion is occurring.

Appendix A
Boring Logs

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28MM01

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR: Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: Approximately 22.4 ft bgs — Start: 05/15/03 — END : 05/15/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0	0' - 4'	40"	1-S	NA	Upper 6" is fine to coarse grained sand with abundant gravel, subangular. Lower 34" is silty clay, stiff, no plasticity, orange, dry.	ML	Collect Soil Sample ID IS28SS01-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN. Collect Soil Sample ID IS28SB01-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.
2							
4							

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28MM02

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR: Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: Approximately 16.5 ft bgs — Start: 05/12/03 — END : 05/12/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.)	USCS	COMMENTS (DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole)
	0' - 4'	36"	1-S	NA	Sandy silty clay with abundant quarzite gravel, rounded, fine grained sand. Some organics present (roots). Light brown, moist.	SM	PID Reading = 0.0 Collect Soil Sample ID IS28SS02-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN.
2							
4	End of boring						Collect Soil Sample ID IS28SB02-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28MM03

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR: Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: Approximately 15 ft bgs — Start: 05/12/03 — END : 05/12/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.)	USCS	COMMENTS (DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole)
0	0' - 4'	24"	1-S	NA	Silty clayey sand, fine grained sand. Dark orange sand lenses present. Yellowish orange, damp.	SM	PID Reading = 0.0 Collect Soil Sample ID IS28SS03-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN.
2							
4	End of boring						Collect Soil Sample ID IS28SB03-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28MM05

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR: Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: Approximately 8 ft bgs — Start: 05/12/03 — END : 05/12/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0	0' - 4'	24"	1-S	NA	Upper 6" is silty clayey sand, fine grained, dark grey, damp. Lower 18" is silty clayey sand, fine grained, some rounded pebbles present. Light grey, damp.	SM	PID Reading = 0.0 Collect Soil Sample ID IS28SS05-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN.
2							
4	End of boring						Collect Soil Sample ID IS28SB05-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28MM06

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR: Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: Approximately 12.3 ft bgs — Start: 05/15/03 — END : 05/15/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0' - 4'	12"	1-S	NA	Upper 2" is fine grained sand with organics (roots) and some rounded pebbles. Middle 6" is sandy silty clay, fine grained, medium stiff, high plasticity, yellowish orange. Lower 4" is silty clay, stiff, slight plasticity, moist.	OL	Collect Soil Sample ID IS28SS06-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, T Grain Size, Explosives, NG, NQ, PETN.
2							Collect Soil Sample ID IS28SB06-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.
4	End of boring						

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28MM07

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR: Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: Approximately 12 ft bgs — Start: 05/16/03 — END : 05/16/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.)	USCS	COMMENTS (DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole)
	0' - 4'	36"	1-S	NA	Upper 10" is silty clay with grey clay lenses, medium stiff, yellow orange, moist. Lower 26" is sand, fine grained, dense, some angular gravel throughout, yellow orange - light grey.	ML	Collect Soil Sample ID IS28SS07-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN.
2							
4	End of boring						Collect Soil Sample ID IS28SB07-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28MM11

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR: Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: Approximately 0.8 ft bgs — Start: 05/13/03 — END : 05/13/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.)	USCS	COMMENTS (DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole)
0	0' - 4'	18"	1-S	NA	Upper 12" is sandy silty clay, soft. Lower 6" is silty clay, soft, high plasticity, orange clay lenses present, light grey, wet.	CL	PID Reading = 0.0 Collect Soil Sample ID IS28SS11-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN.
2							
4	End of boring						Collect Soil Sample ID IS28SB11-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28MM14

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: Approximately 5.1 ft bgs — Start: 05/15/03 — END : 05/15/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0' - 4'	30"	1-S	NA	Sand, fine grained, subangular gravel, brown, damp.	SM	
2							Collect Soil Sample ID IS28SS14-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN.
4	End of boring						Collect Soil Sample ID IS28SB14-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28MM16

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: Approximately 18 ft bgs — Start: 05/14/03 — END : 05/14/2003 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0' - 4'	36"	1-S	NA	Upper 12" is dark organic loam (roots) with some rounded gravel throughout. Lower 24" is silty sand, fine grained, with abundant gravel, light brown, dry.	SM	Collect Soil Sample ID IS28SS16-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN. Collect Soil Sample ID IS28SB16-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.
4							
6	4' - 7'	36"	2-S	NA	Upper 6" is same as above. Middle 18" is sand and gravel, fine to medium grained sand, quartzite gravel. Lower 12" is sand, fine grained, dense, yellowish orange, dry.	SP	
8	7' - 11'	48"	3-S	NA	Upper 6" is same as above. Lower 42" is silty clayey sand, fine grained with orange clay mottling, dry.	ML	
10							
12	11' - 15'	48"	4-S	NA	Same as above. 1" layer of fine sand with rounded pebbles.	ML	

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
14							
	15' - 18'	48"	5-S	NA	Upper 18" is sandy sity clay, fine grained sand, soft, low plasticity, some rounded gravel, light grey, damp. Middle 12" is same as above, moist - wet, yellowish orange - light grey. Lower 6" is fine dense sand, orange - grey	ML to SM	
16							
18							
	18' - 22'	48"	6-S	NA	Sand, fine grained, dense, saturated, light grey.	SP	
20							
22							
	22' - 26'	48"	7-S	NA	Same as above. Auger hit refusal at 26 feet bgs. It is possible that confining clay layer is at 26' bgs.		
24							
26	End of boring						

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28MM23

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR: Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: Approximately 1.45 ft bgs — Start: 05/16/03 — END : 05/16/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0' - 2'	10"	1-S	NA	Sandy clay, fine grained, dark organic loam (roots), wet. Lower 2" is saturated.	ML	Collect Soil Sample ID IS28SS23-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN.
2	2' - 4'	10"	2-S	NA	Silty clay, soft, slight plasticity, dark brown, saturated.	ML	Collect Soil Sample ID IS28SB23-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.
4	End of boring						

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28MM27

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: Approximately 4.5 ft bgs — Start: 05/16/03 — END : 05/16/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.)	USCS	COMMENTS (DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole)
2	0' - 2'	22"	1-S	NA	Upper 6" is sandy clay, fine grained sand, soft, slight plasticity, brown. Lower 16" is fine silty sand, grey, wet.	SM	Collect Soil Sample ID IS28SS27-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN.
4	2' - 4'	18"	2-S	NA	Fine sand, loose, light brown, saturated.	SM	Collect Soil Sample ID IS28SB27-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.
	End of boring						

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28MM28

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: Approximately — Start: 05/20/03 — END : 05/20/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0' - 2'	12"	1-S	NA	Upper 3" is dark organic loam (roots and leaves). Lower 9" is fine sandy clay, medium plasticity, yellowish orange - grey, soft, wet.		Collect Soil Sample ID IS28SS28-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, T Grain Size, Explosives, NG, NQ, PETN.
4	2' - 4'	24"	2-S	NA	Upper 10" is same as above. Lower 14" is fine sand, wet.		Collect Soil Sample ID IS28SB28-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28MM42

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR: Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: Approximately 3.5 ft bgs — Start: 05/14/03 — END : 05/14/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0' - 4'	18"	1-S	NA	Sandy silty clay, fine to medium grained with subangular gravel. Some organics present (roots) and anthropogenics (cinders). Brown, wet.	CL	Collect Soil Sample ID IS28SS42-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN.
4							Collect Soil Sample ID IS28SB42-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.
6	4' - 8'	36"	2-S	NA	Upper 5" is sand, fine to coarse sand and gravel, loose, grey, saturated. Middle 7" is sand and gravel, fine to coarse grained sand and fine gravel. Orange, saturated. Lower 17" is clay, very stiff, no plasticity, grey, damp.	SW to CL	
8	End of boring						

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28MW01

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : 4.3 ft msl — DRILLING CONTRACTOR: Parratt Wolff, Inc.

DRILLING METHOD AND EQUIPMENT USED : 4.25-inch Hollow Stem Augers with 2' Split Spoons (SPT)

WATER LEVEL: 3.4 ft msl — Start: 08/19/03 — END : 08/19/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0' - 2'	1"	1-S	WOH	Refusal. Saturated at 1' bgs. Dark grey brown, sand and gravel, 5YR 4/1. Saturated.	SP	PID = 0.0
4	2' - 4'	3"	2-S	WOH-1-1	Fine sand and gravel, coarse quartzite gravel, loose, rounded. 5YR 4/1 dark grey. Saturated.	SP	PID = 0.3
6	4' - 6'	24"	3-S	1-1-1-1 (2)	Upper 22" is same as above. Lower 2" is fine sandy clay, very soft, medium plasticity, light grey with orange clay lenses. 7.5YR 5/1. Saturated.	SP to CL	PID = 0.0
8	6' - 8'	4"	4-S	1-2-1-1 (3)	Same as above, fine sandy clay, dark grey. 7.5YR 4/1. Saturated.	CL	PID = 0.0

WOH = Weight of Hammer

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28MW02

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : 9.3 ft msl — DRILLING CONTRACTOR: Parratt Wolff, Inc.

DRILLING METHOD AND EQUIPMENT USED : 4.25-inch Hollow Stem Augers with 2' Split Spoons (SPT)

WATER LEVEL: 9.21 ft msl — Start: 08/20/03 — END : 08/20/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0' - 2'	7"	1-S	WOH-WOH 4-5	Upper 4" is dark organic loam (roots). Lower 3" is silt, grey 10YR 6/2, soft. Some quartzite gravel present, subangular, damp.	ML	PID = 0.0
4	2' - 4'	14"	2-S	3-3-2-3 (5)	Upper 7" is same as above, no gravel. Lower 7" is silty clay, stiff, orange clay lenses throughout, high plasticity, grey 2.5Y 7/1, wet.	CH	PID = 0.3
6	4' - 6'	20"	3-S	1-2-2-5 (4)	Upper 3" is slough, organic loam. Middle 5" is clay, soft, high plasticity, saturated. Lower 12" is same as above, very stiff, low to medium plasticity, light grey 2.5Y 5/2, wet.	CH CL	PID = 0.0

WOH = Weight of Hammer

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28MW03

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : 39.9 ft msl — DRILLING CONTRACTOR: Parratt Wolff, Inc.

DRILLING METHOD AND EQUIPMENT USED : 4.25-inch Hollow Stem Augers with 2' Split Spoons (SPT)

WATER LEVEL: 14.72' BTOC — Start: 08/19/03 — END : 08/19/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
0	0' - 2'	3"	1-S	WOH-WOH 1-2	Fine sandy clay, orange 7.5YR 6/8, grey clay lens, medium plasticity, low plasticity, ~50% sand. Damp.	SC	PID = 0.0
2	2' - 4'	3.5"	2-S	WOH-2	Fine sandy clay, ~15% sand, soft, medium plasticity, some quartzite gravel present, medium grained gravel, yellowish orange 10YR 5/6, damp.	CL	PID = 0.0
4	4' - 6'	20"	3-S	WOH-WOH 5-4	Upper 5" is fine to coarse sandy clay with few roots, orange 10YR 5/6, high plasticity, medium stiff. Middle 10" is same as above but very stiff, grey sand lens. Lower 5" is fine sandy silt, soft, grey 2.5Y 5/1. Wet.	SC to SM	PID = 0.0
6	6' - 8'	24"	4-S	3-5-7-8 (12)	Same as above. Lower 2" of spoon is very stiff clay, 2.5Y 5/1. Saturated.	SM to ML	PID = 3.3
8	8' - 10'	24"	5-S	3-6-7-7 (13)	Upper 8" is slough, sandy clay and gravel, fine to coarse grained sand, orange 10YR 5/6. Middle 3" is very stiff grey clay, grey 10YR 6/1. Lower 13" is sandy silt, fine grained, light grey 2.5Y 6/1, stiff, dense, saturated.	SP CL SM	PID = 0.0
10	10' - 12'	24"	6-S	8-9-8-6 (17)	Same as above.	SM	PID = 0.0
12	12' - 14'	20"	7-S	6-7-7-13 (14)	Upper 5" is silty clay, high plasticity, medium stiff, grey 2.5Y 5/3. Middle 6" is sand and gravel, fine to medium grained, loose, orange 2.5Y 5/6. Lower 9" is very dense fine sand, grey, 2.5Y 7/1. Saturated.	CH SP SP	PID = 0.0
14	End of boring						

WOH = Weight of Hammer

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28MW04

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : 35.8 ft msl — DRILLING CONTRACTOR: Parratt Wolff, Inc.

DRILLING METHOD AND EQUIPMENT USED : 4.25-inch Hollow Stem Augers with 2' Split Spoons (SPT)

WATER LEVEL: 28.07 ft msl — Start: 08/20/03 — END : 08/20/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone / Above Hole
0	0' - 2'	21"	1-S	4-4-14-28 (18)	Upper 2" is dark organic loam (roots) Middle 10" is silty clay, stiff, low plasticity, some roots present, interbedded orange 7.5YR 5/4 and grey 7.5Y 7/2 clay lenses. Lower 9" is same as above but with abundant quartzite gravel, rounded, medium to coarse gravel, dry.	OL OL GC	PID = 0.0
2	2' - 4'	12"	2-S	20-40-50/2	Upper 6" is fine to coarse sand with rounded pebbles, dense, orange 7.5YR 5/6. Lower 6" is same as above with abundant fine to coarse quartzite gravel, dry.	SP	
4	4' - 6'	20"	3-S	NA	Upper 10" is silty clay with some roots, medium stiff, low plasticity, brown 10YR 5/4. Lower 10" is fine sand with quartzite gravel, subrounded, dense, light grey 2.5Y 7/2, dry.	OL	PID = 700
6	6' - 8'	22"	4-S	38-36-32-30 (68)	Fine sand, few quartzite gravel, subrounded, medium grained, very dense, yellowish brown 2.5Y 6/3 and 2.5Y 7/4, dry.	SP	PID = 235
8	8' - 10'	11"	5-S	40-42-17-8 (59)	Upper 3" is slough, organic silty clay (roots). Lower 8" is fine sand with some very large quartz gravel, rounded, very dense, light brown to grey 2.5Y 6/4. Wet.	SP SP	PID = 201
10	10' - 12'	24"	6-S	2-3-5-4 (8)	Upper 12" is fine sand with medium grained gravel, rounded, loose, yellowish orange 2.5Y 6/4. Lower 12" is fine sand, loose, light grey 2.5 Y 7/2. Saturated.	SW SW	PID = 52
12	12' - 14'	24"	7-S	5-7-12-13 (19)	Same as above, saturated.	SW	PID = 13.6
14	14' - 16'	24"	8-S	7-9-14-21 (23)	Same as above, medium dense. 2" lense of clay with some roots, medium stiff, interbedded orange and grey, medium to high plasticity, 10YR 5/4, saturated.	SW	PID = 17.3
16	16' - 18'	24"	9-S	3-4-4-5 (8)	Same as above except no clay lense, saturated.	SW	PID = 4.8

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
18							
	18' - 20'	24"	10-S	5-12-17-19 (29)	Fine to medium grained sand, quartz sand, light grey 10YR 6/1. 1" clay lense at 19' bgs, soft, high plasticity, yellow 2.5Y 6/3, medium dense, saturated.	SW	PID = 25
20							
	20' - 22'	24"	11-S	5-5-17-20 (22)	Fine to medium grained sand, light grey 10YR 6/2. 2.5" clay lense at 21' bgs, soft, meduim plasticity, yellowish brown 10YR 5/4, medium dense.	SW	PID = 6.8
22							
	22' - 24'	19"	12-S	6-9-10-14 (19)	Upper 17" is same as above, grey sand. Lower 2" is clay, soft, high plasticity, olive grey brown 2.5Y 5/3, medium dense, saturated.	SW CL	PID = 52
24							
	24' - 26'	24"	13-S	4-7-10-12 (17)	Upper 2" is slough, grey sand. Lower 22" is confining unit - clay, very stiff, low plasticity, yellowish brown (10YR 6/1) and grey (10YR 4/6) clay lenses, damp.	CL	PID = 13.6
26	End of boring, collect shelby tube 26' - 28' bgs.						

NA = Not available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28MW05

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : 74.1 ft msl — DRILLING CONTRACTOR: Parratt Wolff, Inc.

DRILLING METHOD AND EQUIPMENT USED : 4.25-inch Hollow Stem Augers with 2' Split Spoons (SPT)

WATER LEVEL: 40.99 ft msl — Start: 08/21/03 — END : 08/21/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0' - 2'	18"	1-S	4-5-6-6 (11)	Upper 14" is silty sand, fine grained, roots present, quartzite gravel content increases with depth, orange to red 7.5YR 4/6 to 7.5YR 3/2, loose. Lower 4" is silty clay, very stiff, roots, grey clay nodules, orange 7.5YR 5/6, low plasticity.dry	SM CL	PID = 10.9
4	2' - 4'	18"	2-S	4-6-7-7 (13)	Silt, some roots present, orange clay nodules present throughout, dark yellowish brown 10YR 4/6, dry.	OL	PID = 52
6	4' - 6'	24"	3-S	4-6-6-7 (12)	Upper 6" is sandy silt with some gravel, fine sand, subangular medium gravel, large root present. Lower 18" is silty clay, very stiff, low plasticity, (orange - brown) 7.5YR 4/6.	ML CL	PID = 5.5
8	6' - 8'	24"	4-S	11-15-24-27 (39)	Upper 3" is black organic loam (roots and leaves), 7.5YR 2.5/1. Wet Middle 6" is sandy silt, fine sand, abundant quartz gravel, rounded, dark brown 7.5YR 3/4. Dry. Lower 14" is very stiff clay, low plasticity, orange-brown 7.5YR 4/6. Dry. Lower 1" is silt with abundant quartzite gravel, rounded. Dry	OL SM CL GP	PID = 9.6
10	8' - 10'	24"	5-S	15-16-10-12 (26)	Sand and gravel, fine to medium grained sand, quartzite gravel, rounded to subrounded, gravel content decreases with depth, orange to brown 7.5YR 4/6.	SP	PID = 4
12	10' - 12'	24"	6-S	5-6-24-40 (30)	Upper 4" is sandy silt with quartzite gravel, some mica fragments present, subrounded gravel, damp. Lower 19" is silt, grey clay nodules throughout, orange 7.5YR 4/6, dry. Bottom of spoon is large gravel, subrounded.	SM ML	PID = 4000
14	12' - 14'	21"	7-S	40-27-28-30 (55)	Sand and gravel, fine grained sand, quartzite and feldspar gravel, few very dark brown clay nodules, orange 7.5YR 4/6, very large quartzite gravel at bottom of spoon.	SP	PID = 2.6
16	14' - 16'	24"	8-S	14-16-48-15 (54)	Upper 20" is sandy silt and gravel, fine grained sand, orange 7.5YR 4/6, stiff, dry. Lower 4" is fine sand and gravel, light yellowish brown 2.5Y 6/4, dry.	SM	PID = +9999
	16' - 18'	18"	9-S	17-19-20-15 (39)	Fine to coarse sand and gravel, quartzite gravel, subangular, red clay nodules present, lower 6" is wet, orange 7.5YR 4/6.	SP	PID = 16

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
18							
	18' - 20'	10"	10-S	12-14-12-24 (26)	Fine to coarse sand and gravel, quartzite gravel, yellowish orange 7.5YR 5/4, rounded to subrounded gravel, damp.	SP	PID = 2
20							
	20' - 22'	19"	11-S	27-35-35-15 (70)	Same as above, orange 10YR 5/8, damp.	SP	PID = 9.6
22							
	22' - 24'	18"	12-S	NA	Same as above, orange clay nodules present 7.5YR 6/6, damp, strong brown 7.5YR 5/8.	SP	PID = 0.0
24							
	24' - 26'	18"	13-S	12-13-25-24 (38)	Same as above, lower 8" doesn't contain gravel.	SP	PID = 4.0
26							
	26' - 28'	24"	14-S	17-27-20-23 (47)	Same as above, lower 12" has abundant quartz gravel, moist to wet.	SP	PID = 3.4
28							
	28' - 30'	19"	15-S	40-28-30-31 (58)	Same as above, abundant quartzite gravel, damp.	SP	PID = 0.0
30							
	30' - 32'	21"	16-S	12-14-17-19 (31)	Same as above, rounded quartzite gravel and siltstone fragments, orange 10Y 5/6, wet.	SP	PID = 9.6
32							
	32' - 34'	19"	17-S	15-15-16-21 (31)	Sand and gravel, fine sand, gravel content decreases with depth, subangular gravel, orange 10YR 5/6. Large quarzite gravel at bottom of spoon, wet.	SP	PID = 0.0
34							
	34' - 36'	5"	18-S	9-12-14-12 (26)	Same as above, saturated.	SP	PID = 4.0
36	End of boring						

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28MW07

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR: Parratt Wolff, Inc.

DRILLING METHOD AND EQUIPMENT USED : 4.25-inch Hollow Stem Augers with 2' Split Spoons (SPT)

WATER LEVEL: — Start: 08/19/03 — END : 08/19/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0' - 2'	4"	1-S	3-2-2-2 (4)	Upper 3" is organic loam (roots and leaves). Lower 1" is sand and gravel, angular quartzite . gravel, fine grained sand, dry.	GP	PID = 2.0
2	2' - 4'	9"	2-S	4-1-1-2 (2)	Upper 5" is fine to coarse sand and gravel, dark grey 7.5YR 3/1, subrounded to subangular quartzite gravel, fine to c0arse gravel. Lower 4" is clay, yellowish orange 10YR 6/6, soft to medium stiff, high plasticity. Grey clay lenses throughout 10YR 6/1, moist.	GP CH	PID = 0.0
4	4' - 6'	24"	3-S	3-3-3-5 (6)	Upper 12" is same as above. Lower 12" is clay, very stiff, interbedded grey (10YR 6/6) and orange (10YR 6/1) clay lenses, low plasticity, dry.	CH to OL	PID = 0.0
6	End of boring, collect shelby tube from 6' - 8' bgs.						

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28SO04

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR: Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: — Start: 05/20/03 — END : 05/20/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0' - 2'	17"	1-S	NA	Upper 12" is fine sand, dark brown, moist. Lower 5" is clayey sand, fine grained, yellowish orange clay lenses present. grey, wet.		Collect Soil Sample ID IS28SS04-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN.
2	2' - 4'	24"	2-S	NA	Same as above, saturated.		Collect Soil Sample ID IS28SB04-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.
4							

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28SO08

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR: Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: — Start: 05/13/03 — END : 05/13/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0' - 4'	30"	1-S	NA	Silty sand, fine grained, loose, yellowish orange - grey, damp.	SM	PID Reading = 0.0 Collect Soil Sample ID IS28SS08-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN.
2							
4	End of boring						Collect Soil Sample ID IS28SB08-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28SO09

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR: Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: — Start: 05/12/03 — END : 05/12/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0	0' - 4'	36"	1-S	NA	Fine grained sand, loose, yellowish orange, dry.	SM	PID Reading = 0.0
2							Collect Soil Sample ID IS28SS09-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN. Collect Soil Sample ID IS28SB09-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.
4	End of boring						

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28SO10

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR: Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: — Start: 05/13/03 — END : 05/13/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.)	USCS	COMMENTS (DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole)
0	0' - 4'	18"	1-S	NA	Upper 12" is silty clayey sand, medium dense, orange clay lenses present, light brown. Lower 6" is fine sand, loose, coarse gravel throughout, subrounded, light brown, moist.	SM	PID Reading = 0.0
2							Collect Soil Sample ID IS28SS10-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN. Collect Soil Sample ID IS28SB10-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.
4	End of boring						

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28SO12

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR: Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: — Start: 05/20/03 — END : 05/20/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0' - 2'	12"	1-S	NA	Clay, soft, high plasticity, medium stiff, grey clay lenses present. Orangish yellow, damp		Collect Soil Sample ID IS28SS12-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN.
4	2' - 4'	24"	2-S	NA	Clay, medium stiff, brittle, no plasticity, red-grey. dry.		Collect Soil Sample ID IS28SB12-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.
	End of boring						

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28SO13

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR: Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: — Start: 05/13/03 — END : 05/13/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
0	0' - 4'	36"	1-S	NA	Sand, fine grained, loose, orange, dry.	SM	PID Reading = 0.0
2							Collect Soil Sample ID IS28SS13-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN.
							Collect Soil Sample ID IS28SB13-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.
4	End of boring						

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28SO15

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR: Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: — Start: 05/13/03 — END : 05/13/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0' - 4'	32"	1-S	NA	Sand, fine grained, loose, some rounded pebbles present, wet. Upper 12" is dark brown. Lower 20" is light grey.	SM	PID Reading = 0.0
2							Collect Soil Sample ID IS28SS15-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN. Collect Soil Sample ID IS28SB15-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.
4	End of boring						

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28SO17

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR: Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: — Start: 05/12/03 — END : 05/12/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0' - 4'	30"	1-S	NA	Silty sand, fine to medium grained sand with some rounded pebbles, light brown to yellowish orange, wet.	SM	PID Reading = 0.0
2							Collect Soil Sample ID IS28SS17-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN.
							Collect Soil Sample ID IS28SB17-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.
4	End of boring						

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28SO18

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR: Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: — Start: 05/13/03 — END : 05/13/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0' - 4'	10"	1-S	NA	Silty sand, fine grained, loose, light grey - brown, saturated.	SM	PID Reading = 0.0
2							Collect Soil Sample ID IS28SS18-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN.
							Collect Soil Sample ID IS28SB18-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.
4	End of boring						

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28SO19

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : _ — DRILLING CONTRACTOR: Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: — Start: 05/13/03 — END : 05/13/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.)	USCS	COMMENTS (DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole)
0	0' - 4'	30"	1-S	NA	Sand, fine grained, some rounded pebbles present and some organic material (roots), dark brown.	SM	PID Reading = 0.0
2							Collect Soil Sample ID IS28SS19-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN.
							Collect Soil Sample ID IS28SB19-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.
4	End of boring						

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28SO21

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: Approximately 2 ft bgs — Start: 05/19/03 — END : 05/19/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
	0' - 2'	24"	1-S	NA	Upper 2" is dark brown organic loam (roots and worms). Lower 22" is fine sand, light grey, moist.		Collect Soil Sample ID IS28SS24-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN.
2	2' - 4'	24"	2-S	NA	Upper 12" is same as above, saturated. Lower 12" is clay, very stiff.		Collect Soil Sample ID IS28SB24-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.
4	End of boring						

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28SO22

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR: Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: — Start: 05/14/03 — END : 05/14/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0' - 2'	22"	1-S	NA	Upper 18" is sandy silt, fine grained, orange, dry. Lower 4" is sandy clay, fine grained with orange clay lenses. grey, dry.	CL	Collect Soil Sample ID IS28SS22-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN.
4	2' - 4'	24"	2-S	NA	Same as above	CL	PID Reading = 0.0 Collect Soil Sample ID IS28SB22-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.
	End of boring						

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28SO24

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR: Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: — Start: 05/14/03 — END : 05/14/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0' - 2'	12"	1-S	NA	Sandy silty clay, fine grained sand, orange clay lenses present. Light grey, dry.	CL	Collect Soil Sample ID IS28SS24-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN.
4	2' - 4'	12"	2-S	NA	Same as above.	CL	PID Reading = 0.0 Collect Soil Sample ID IS28SB24-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.
	End of boring						

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28SO26

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR: Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: ~ 2 feet bgs — Start: 05/19/03 — END : 05/19/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0' - 2'	20"	1-S	NA	Upper 2" is sandy clay. Lower 18" is fine sand, loose, wet.		Collect Soil Sample ID IS28SS26-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN.
4	2' - 4'	24"	2-S	NA	Fine sand, some pebbles present, light brown - grey, saturated.		Collect Soil Sample ID IS28SB26-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.
	End of boring						

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28SO29

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR: Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: Approximately 2 ft bgs — Start: 05/19/03 — END : 05/19/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0' - 2'	24"	1-S	NA	Fine sand, light grey - yellowish orange, saturated.		Collect Soil Sample ID IS28SS29-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN.
4	2' - 4'	24"	2-S	NA	Same as above.		Collect Soil Sample ID IS28SB29-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.
	End of boring						

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28SO34

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR: Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: — Start: 05/15/03 — END : 05/15/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.)	USCS	COMMENTS (DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole)
0	0' - 4'	18"	1-S	NA	Sand and gravel, fine to coarse grained sand, rounded gravel, brown - yellowish orange, wet.	SM	Collect Soil Sample ID IS28SS34-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN.
2							Collect Soil Sample ID IS28SB34-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.
4	End of boring						

NA = Not Available

CH2MHILL

PROJECT NUMBER	BORING NUMBER
152962	IS28SO39

SOIL BORING LOG

PROJECT : Indian Head Well Installation — LOCATION : Indian Head, Maryland

ELEVATION : — DRILLING CONTRACTOR Columbia Technologies

DRILLING METHOD AND EQUIPMENT USED : Geoprobe 54 DT

WATER LEVEL: — Start: 05/16/03 — END : 05/16/03 — LOGGER : C. Brown

DEPTH BELOW SURFACE (FT)	INTERVAL (FT)	RECOVERY (IN)	#/TYPE	STANDARD PENETRATION TEST RESULTS 6"-6"-6"-6" (N)	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY, OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY.	USCS	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, AND INSTRUMENTATION. OVM (ppm): Breathing Zone Above Hole
2	0' - 2'	12"	1-S	NA	Sandy silty clay, slight plasticity, soft, light brown, wet.		Collect Soil Sample ID IS28SS39-0001 for VOCs, Metals, SVOCs, Perchlorate, pH, TOC Grain Size, Explosives, NG, NQ, PETN.
4	2' - 4'	12"	2-S	NA	Same as above.		Collect Soil Sample ID IS28SB39-0103 for VOCs, SVOCs, Metals, Perchlorate, and Explosives.
	End of boring						

NA = Not Available

Appendix B
Shelby Tube Soil Hydraulic Conductivity Analysis Results

PW Laboratories, Inc.

TELEPHONE AREA CODE 315-437-1420 FAX NO. 315-437-1752

OJECT NUMBER _____

DATE: November 18, 2003

NUMBER OF PAGES BEING SENT: 7 (Including this one)

TO: Mr. Adrian Hanley
COMPANY: CH2M Hill
TELEPHONE (FAX): 703-471-1508
FROM: Virginia Thoma

TO FOLLOW BY MAIL: X
FAX ONLY: _____

MESSAGE:

Adrian:

Following are results of laboratory testing for Indian Head.

Thank you for the opportunity to work with you.

Ginny

IF YOU DO NOT RECEIVE ANY OF THESE PAGES PLEASE CONTACT THE TELECOPY OPERATOR AT (315) 437-1420. THANK YOU.
TRANSMISSION COMPLETED AND CONFIRMED

PW LABORATORIES INC.
P.O. BOX 56, 5879 FISHER ROAD, EAST SYRACUSE, NY 13057
315-437-1420 • (866) 7PW-LABS • FAX 315-437-1752

November 18, 2003

Mr. Adrian Hanley
CH2M Hill
13921 Park Center Road
Suite 600
Herndon, Virginia 20171

Re: L-03139
Laboratory Testing
Indian Head, Maryland

Dear Mr. Hanely:

Enclosed are the results of laboratory testing performed at your request on two Shelby tube soil samples delivered to our laboratory on August 25, 2003 for the above referenced project. Results include:

1.	Sieve Analysis ASTM D422 & D1140 Laboratory I.D. # 17191 and 17192	2 each
2.	Atterberg Limits ASTM D4318 Laboratory I.D. # 17191 and 17192	2 each
3.	Hydraulic Conductivity - Flexible Wall ASTM D5084 Laboratory I.D. # 17191 and 17192	2 each

All requested tests have been completed on the previously received sample(s) for the above project. All sample remains are scheduled to be disposed of on December 17, 2003. Please notify PW Laboratories, Inc. by letter or telephone prior to December 17, 2003 if you would prefer to pick up the sample(s) or that the sample(s) be retained by PW Laboratories, Inc. for an additional period of time.

November 18, 2003
CH2M Hill
Herndon, Virginia 20171

Re: L-03139
Laboratory Testing
Indian Head, Maryland

Thank you for this opportunity to work with you.

Very truly yours,

PW LABORATORIES, INC.

Virginia J. Thoma
Manager - Laboratory Services
VJT/bap
encs:
cc: Mr. Robert Stevens
Parratt-Wolff, Inc.
501 Millstone Drive
P.O. Box 1029
Hillsborough, North Carolina, 27278

PW LABORATORIES INC.
P.O. BOX 88, 5879 FISHER ROAD, EAST SYRACUSE, NY 13057
315-437-1420 • (866) 7PW-LABS • FAX 315-437-1752

SIEVE ANALYSIS OF SOIL / AGGREGATE

PROJECT TITLE Laboratory Testing - Indian Head

PROJECT # L-03139
TEST METHOD ASTM D422 & D1140

REPORT # 1
REPORT DATE: November 18, 2003

			Sieve Size - Percent Passing Sieve														
Lab I.D. #	Sample	Depth (Feet)	#10	#30	#40	#60	#100	#200									
17191	Indian Head Base	6.0 - 8.0	--	100	99.7	98.2	96.1	90.5									
17192	Indian Head Base	26.0 - 28.0	100	97.8	94.4	87.7	83.9	76.7									

Sample mass, as received, meets minimum mass requirements of test method: Yes X No ____

Remarks:

Prewashed: Yes X No ____

Performed By: CP

Checked By: V.J. Thoma

PW LABORATORIES INC.
P.O. BOX 66, 5878 FISHER ROAD, EAST SYRACUSE, NY 13057
315-437-1420 • (888) 7PW-LABS • FAX 315-437-1752

November 18, 2003

L-03139
Laboratory Testing
Indian Head

ATTERBERG LIMITS
ASTM D4318

Lab ID#	Sample #.	Depth (feet)	Plastic Limit	Liquid Limit	Plasticity Index
17191	Indian Head Base	6.0 – 8.0	35	66	31
17192	Indian Head Base	26.0 – 28.0	33	77	44

PW LABORATORIES INC.
P.O. BOX 56, 5879 FISHER ROAD, EAST SYRACUSE, NY 13057
315-437-1420 • (888) 7PW-LABS • FAX 315-437-1752

REPORT DATE: November 18, 2003

Test Start Date 9/9/03

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter ASTM D5084

Project No.: L-03139 / Project Title: Laboratory Testing - Indian Head

ST. No: -- / Lab ID#: 17191 / Test Sample Location: Indian Head Base

Depth/Lift/Elev.: 6.0' - 8.0' / Type of Sample: Undisturbed X Remolded --

Method of Compaction: -- / Percent Compaction: --

Dry Unit Weight (PCF) Maximum: -- Initial: 90.9 / Moisture Content (% of Dry Weight): Optimum: -- Initial: 31.1

Initial Height (cm): 10.98 / Initial Diameter (cm): 7.25 / Initial Gradient: 25.6

Initial Degree of Saturation (B Value) (%): -- / Permeant Liquid Used: Deaired Deionized H_2O

Confining Pressure (PSI): 71.0 / Test (head) Pressure (PSI): 68.0 / Tail (back) Pressure (PSI): 64.0

Final Degree of Saturation (B Value) (%): 98 / Final Dry Unit Weight (PCF): 90.4 / Final Gradient: 25.5

Final Height (cm): 11.04 / Final Diameter (cm): 7.25 / Final Moisture Content (% of Dry Weight): 34.4

Final Four Determinations k (cm/sec)

$4.92X10^{-8}$	$4.92X10^{-8}$	$4.92X10^{-8}$	$4.93X10^{-8}$

Mean Value of Final Four Consecutive Determinations:

Coefficient of Permeability k (cm/sec): $4.92X10^{-8}$

Project Specifications: --

Notes:

pw labs

LABORATORIES INC.
P.O. BOX 58, 5879 FISHER ROAD, EAST SYRACUSE, NY 13057
315-437-1420 - (866) 7PW-LABS - FAX 315-437-1752

REPORT

DATE: November 18, 2003

Test Start Date 9/26/03

Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter ASTM D5084

Project No.: L-03139 / Project Title: Laboratory Testing - Indian Head

ST. No: -- / Lab ID#: 17192 / Test Sample Location: Indian Head Base

Depth/Lift/Elev.: 26.0' - 28.0' / Type of Sample: Undisturbed X Remolded --

Method of Compaction: -- / Percent Compaction: --

Dry Unit Weight (PCF) Maximum: -- Initial: 91.0 / Moisture Content (% of Dry Weight): Optimum: -- Initial: 31.7

al Height (cm): 10.92 / Initial Diameter (cm): 7.20 / Initial Gradient: 25.8

Initial Degree of Saturation (B Value) (%): -- / Permeant Liquid Used: Deaired Deionized H_2O

Confining Pressure (PSI): 71.0 / Test (head) Pressure (PSI): 68.0 / Tail (back) Pressure (PSI): 64.0

Final Degree of Saturation (B Value) (%): 96 / Final Dry Unit Weight (PCF): 88.4 / Final Gradient: 25.7

Final Height (cm): 10.96 / Final Diameter (cm): 7.29 / Final Moisture Content (% of Dry Weight): 28.9

Final Four Determinations k (cm/sec)

$2.19X10^{-9}$	$1.69X10^{-9}$	$1.60X10^{-9}$	--

Mean Value of Final Three Consecutive Determinations:

Coefficient of Permeability k (cm/sec): $1.89X10^{-9}$

Project Specifications: --

Notes: Due to time constraints, client requested that further testing of this sample be ceased. Final determinations do not conform to ASTM D5084 as there were not four consecutive determinations.

Appendix C
Raw Analytical Data and Data Quality Evaluation Report

Appendix C

C.1 Data Quality Assessment

The data quality was evaluated to assess the usability of the analytical results. The analytical data quality is dependent on laboratory performance, matrix interference, ambient laboratory and field conditions, and field sampling technique. Data quality is used to assess whether the project's data quality objectives were met. The data quality assessment comprised reviewing the results of the laboratory quality control (QC) review, the data validation reports, and the data validation qualifiers applied to the data.

C.1.1 Laboratory Quality Control Review

Prior to the release of the analytical results, the laboratory reviewed the sample and QC data to verify sample identity, instrument calibration, detection limits, dilution factors, numerical computations, accuracy of transcriptions, and chemical interpretations. Additionally, the QC data were reduced and the results were reviewed to ascertain whether they were within the laboratory-defined limits for accuracy and precision. Non-conforming results were identified and were discussed in the data package cover letter and associated case narrative.

C.1.2 Data Validation

The data packages were reviewed by an independent data validator based on the validation criteria outlined by USEPA Region III (1993b, 1994a). As specified in USEPA Region III's *Innovative Approaches to Data Validation* (June 1995) a level M-3 data validation was performed on the organic analytes, and a level IM-2 data validation was performed on the inorganic analytes. This data review process was independent of the laboratory review. The review completed by the validator focused on the impact that the laboratory performance and matrix effect had on the analytical results. Areas of review included holding time compliance, surrogate recovery accuracy, matrix spiked sample precision and accuracy, blank contamination, initial and continuing calibration accuracy and precision, laboratory control sample accuracy, internal standard response and retention time accuracy, instrument tune criteria accuracy, laboratory and field sample duplicate precision. Additionally, the analytical spectrum and raw data output were reviewed and the laboratory results were recalculated from the raw data.

Only one result per analyte, per sample was reported. If a sample was reanalyzed or diluted, and thus reported twice, only the result with the best data quality was chosen for reporting.

The following data validation flags were applied to one or more analytical results:

- U Not detected. Samples were analyzed for this analyte, but it was not detected above the reporting limit (RL). This flag is not an indicator of a quality control problem.

- **UJ** Detection limit estimated. Samples were analyzed for this analyte, but the results were qualified as not detected. The concentration that the analyte was not detected at is estimated.
- **J** Estimated. The analyte was present but the reported concentration may not be accurate or precise and is considered an estimate.
- **K** The analyte is present. The reported value may be biased high. The actual value is expected to be lower than reported.
- **UL** The analyte was not detected, the reported quantitation limit is probably higher than reported.
- **L** The analyte is present. The reported values may be biased low. The actual value is expected to be higher than reported.
- **B** Not detected. The analyte was found to be present due to contamination. The concentration of the field result is not statistically greater than the concentration reported in a blank, therefore the field result are corrected to read as "being not detected" at the contaminant concentration.
- **R** Rejected. The analytical result is unusable. (NOTE: Analyte/compound may or may not be detected.)
- **(No qualifier present)** Detected. The result for the target parameter is usable at the concentration reported.

C.1.3 Data Quality Evaluation

The data quality evaluation consisted of reviewing the analytical data for systematic errors. The distribution of data qualifiers and systematic errors are discussed below. An evaluation of the data quality is made based on the number of, severity of, and distribution of these data qualifiers. The data for Site 28 has been divided into two phases of the sampling that took place at the site. The first phase of sampling utilized direct push sampling techniques to collect surface and subsurface soil samples, as well as groundwater samples. The direct push groundwater samples were primarily collected for qualitative purposes for the placement of monitoring wells. The second phase of sampling consisted of collecting water samples from the newly installed monitoring wells. The direct push groundwater samples were not validated and are not included in this data quality evaluation. The findings of the remedial investigation data quality evaluation and the overall assessment, discussed in Section 4.2, are used to make a conclusion of their impact on data usability, which is discussed in Section 4.2.3. For these sampling rounds the data qualifiers were tallied, and the data validation reports were reviewed if clarification on a data quality issue was needed. For the purpose of calculating the percentages of qualified data in Section 4.2.3, the lab qualifiers were used.

C.1.4 Remedial Investigation Data

These are patterns that are found in the distribution of data qualifiers for remedial investigation samples collected from Site 28 at Indian Head Division Naval Surface Warfare Center from May 2003 through September 2003.

Volatile Organic Compounds

VOCs were analyzed by USEPA Contract Laboratory Program (CLP) method OLM04.2. Excluding field quality control samples, 5,145 non-redundant data points were generated. Of these, 3.17 percent (163 results) were "B" qualified, 1.17 percent (60 results) were "J" qualified, 4.68 percent (241 results) were "UJ" qualified, 16.19 percent (833 results) were "UL" qualified, 0.58 percent (30 results) were "L" qualified, 0.02 percent (1 result) was "K" qualified, and 0.04 percent (2 results) were "R" qualified. All "B" qualifiers were due to blank contamination.

The majority of the "J" qualified results (32 results) are in the due to low sample concentrations. The laboratory is required to "J" qualify sample results between the laboratory's method detection limit and the USEPA's contract required reporting limit. The remaining "J" qualifiers, 19 results total, were due to continuing calibration, internal standard, or surrogate spike recoveries not within control limits.

The "UJ" qualifiers were applied to non-detects and were due to low surrogate spike and internal standard recoveries, as well as high continuing calibration recoveries. Since these are all non-detects, this does not have any adverse affects on the data.

The "K" qualifier was applied to carbon tetrachloride as a result of high surrogate spike recoveries. The data user should consider this result as biased high.

The "L" qualifiers were applied to the following four compounds: methyl-tert-butyl-ether, methyl acetate, cis,1-2-dichloroethene, and 1,2-dichloroethylene. The qualifier was applied due to low surrogate spike recoveries. The data user should consider these results as biased low.

Almost all (98%) of the "UL" qualifiers were due to low surrogate spike recoveries of various compounds. A very small percentage of the "UL" qualifiers (2%) were due to low matrix spike recoveries.

The majority of the "B" qualifiers were due to blank contamination primarily from methylene chloride and acetone.

There were only two "R" qualified results. These were due to low relative response factors in the initial calibration for 1,2-dibromo-3-chloropropane. Table 3-1 lists samples that have been qualified with an "R".

Semivolatile Organic Compounds

Semivolatile organic compounds were analyzed by USEPA CLP method OLM04.2. Excluding field quality control samples, 6,825 non-redundant data points were generated. Of these, 1.22 percent (84 results) were "B" qualified, 6.46 percent (441 results) were "J" qualified, 0.22 percent (15 results) were "UL" qualified, and 0.80 percent (55 results) were "R" qualified.

Almost all of the "B" qualifiers were a result of phthalate contamination in the blank. Only eight of the "B" qualified results were for compounds other than phthalates. These two compounds were acetophenone and phenol.

The majority of the "J" qualified results are due to low sample concentrations (i.e., concentrations between the laboratory's method detection limit and the EPA's contract

required reporting limit). A few other "J" qualifiers were due to slight exceedances in the linear range of the instrument, and holding time.

All of the "UL" qualified non-detects were due to low percent recoveries of n-nitroso-di-n-propylamine in the laboratory control sample or matrix spike sample.

The rejected sample results are all caused by exceedances in sample holding times. Table 3-1 lists all samples that have been qualified with an "R".

Semivolatile results for sample IS28SS36-0001 were not used in this data quality assessment. As this sample had detects for 59 compounds out of the 65 reported, the results were considered suspect due to possible laboratory contamination. The laboratory was asked to re-review the data for the semivolatile fraction of the sample. The laboratory identified two steps in the sample preparation process where contamination could have occurred: extraction and concentration. The likelihood that every single SVOC compound is present at approximately 100 ug/L is miniscule. Especially since almost none of these compounds were seen in the surrounding sample locations or the subsurface sample located 2.5 feet directly underneath. The laboratory review of the semivolatile fraction of sample IS28SS36-0001 is included as Attachment A. Upon further discussion of this issue with the data validator and the laboratory, the data validator agreed that the sample should be rejected, Attachment B.

Explosives

Nitroaromatics and nitroamines are analyzed by USEPA's SW-846 method 8330. Nitroglycerine is analyzed by method SW-846 8332, nitroguanidine is analyzed by a modified SW-846 8330, and perchlorate is analyzed by USEPA method 314. Excluding field quality control samples, 1,908 non-redundant data points were generated. Of these 0.89 percent (17 results) were "J" qualified, 3.14 percent (60 results) were "UJ" qualified, 1.26 percent (24 results) were "L" qualified, and 14.62 percent (279 results) were "UL" qualified.

All but one of the "J" qualified results are due to low sample concentrations (i.e., concentrations between the laboratory's method detection limit and the EPA's contract required reporting limit). One "J" qualified result was due to high percent recovery in the continuing calibration standard.

All "UJ" qualified non-detects were due to exceedances in the holding time.

The "L" qualified results were due to low percent recoveries in the laboratory control sample for the following compounds: nitrobenzene, 2,4-dinitrotoluene, and 2,4,6-trinitrotoluene. The data user should consider these results as biased low.

The "UL" qualified non-detects are due to a low percent recoveries in the laboratory control sample, matrix spike sample, and low surrogate spike recoveries in various compounds.

Total Metals

Total metals were analyzed by USEPA CLP method ILM04.2. Excluding field quality control samples, 3,013 non-redundant data points were generated. Of these, 16.13 percent (486 results) were "B" qualified, 31.73 percent (956 results) were "J" qualified, 1.53 percent (46 results) were "UL" qualified, 1.62 percent (58 results) were "L" qualified, 6.47 percent (195 results) were "K" qualified, and 46 results (1.53 percent) were "R" qualified.

The "B" qualified results were a result of various metals contamination in one or more of the associated blanks.

The majority of the "J" qualified results are due to low sample concentrations (i.e., concentrations between the laboratory's method detection limit and the EPA's contract required reporting limit. The remainder of the "J" qualified results were due to poor serial dilution or laboratatory duplicate reproducibility. Chromium, iron, and manganese were the most common metals qualified for poor serial dilution reproducibility, while poor laboratory reproducibility affected a wider variety of the metals.

The "L" and "UL" qualified results were due to low matrix spike recovery for the following compounds: antimony, arsenic, selenium, thallium, and zinc.

The largest majority of the "K" qualified results were due to high recoveries for a variety of analytes in the CRDL standard. The remainder of the "K" qualified results were due to high matrix spike recoveries of lead and manganese. The data user should consider these results biased high.

All of the rejected results were due to matrix spike recoveries of antimony that are below laboratory control criteria. Table 3-1 has a list of samples which were qualified "R" due to matrix spike inefficiencies.

Filtered Metals

Filtered metals were analyzed by USEPA CLP method ILM04.2. Excluding field quality control samples, 230 non-redundant data points were generated. Of these, 17.83 percent (41 results) were "B" qualified, 26.96 percent (62 results) were "J" qualified, 0.43 percent (1 result) was "UL" qualified, and 5.22 percent (12 results) were "K" qualified.

The "B" qualified results were a result of various metals contamination in one or more of the associated blanks.

The majority of the "J" qualified results are due to low sample concentrations (i.e., concentrations between the laboratory's method detection limit and the EPA's contract required reporting limit. The remainder of the "J" qualified results (2 results) were due to poor serial dilution reproducibility for iron.

The only "UL" qualified results was due to low mercury recovery in the CRDL standard.

Wet Chemistry

Samples were analyzed for percent solids by ASTM D2216, pH by SW-846 9045C, total organic carbon by SW-846 9060M, and dissolved organic carbon by USEPA 415.1. No wet chemistry data qualifications were deemed necessary.

C.1.5 Impact of Remedial Investigation Data Quality on Project Data Quality Objectives and Data Usability

The data received were analyzed and reviewed as specified in the work plan:

- The laboratory analyzed the samples in accordance with the USEPA methods as stated in the work plan.

- The data packages were then reviewed by an independent data validator based on the criteria outlined by the USEPA Region III (1993b, 1994a).

The data evaluation showed that the majority of the analytical results (75 percent) were unqualified and acceptable as reported. Nine percent of the total results were qualified "J" as estimated in concentration. The vast majority of these "J" qualifiers are present because the analyte concentration is between the method detection limit and the instrument reporting limit. These "J" qualified results are also acceptable for use as reported. When this is considered, over 84 percent of the results are not qualified and are usable as reported.

The "J", "K", "L", "UJ", and "UL" qualifiers indicate that the data values are estimated. These qualifiers can indicate the presence of a quality control problem, but not a problem that necessarily negatively affects the usability of the data. These data points are considered usable by risk assessors when determining risk to human health and the environment. Data points qualified as such also are considered usable by the project team when assessing impacts to a site.

The sample results qualified with a "B", indicating blank contamination, are usable at their adjusted reporting limits. Sample results with a "B" qualifier made up 4.5 percent of the data. Sample results qualified with a "B" will negatively affect data usability if the blank contamination (and subsequently the elevated reporting limit) is greater than the project's action level for that analyte. Analytes such as acetone and methylene chloride are common laboratory contaminants, and the qualified results should not, alone, be used to make project decisions.

The "R" qualifier indicates that a sample has been rejected. It is not uncommon that some of the data will be rejected during a large environmental sampling effort. Often the project team can work around rejected data by observing data in previous and future rounds of sampling, or by looking at data at adjacent sites. During this RI approximately 0.6 percent of the data were rejected. The results that are rejected should not be used to make project decisions.

With the exception of the "R" qualified results (and with caution regarding the "B" qualified results), the Remedial investigation data for CTO 111 at Site 28 are of sufficient quality to support risk and site assessment.

Table 3-1
Rejected Results

	Sample	Fraction	Compound
RI Data			
	IS28SW01-0503	VOA	1,2-DIBROMO-3-CHLOROPROPANE
	IS28SW02-0503	VOA	1,2-DIBROMO-3-CHLOROPROPANE
	IS28SS40-0001	SVOA	BENZALDEHYDE
	IS28SS40-0001	SVOA	ACENAPHTHENE
	IS28SS40-0001	SVOA	PHENOL
	IS28SS40-0001	SVOA	BIS(2-CHLOROETHYL) ETHER
	IS28SS40-0001	SVOA	2-CHLOROPHENOL
	IS28SS40-0001	SVOA	2,4-DINITROPHENOL
	IS28SS40-0001	SVOA	DIBENZOFURAN
	IS28SS40-0001	SVOA	ACETOPHENONE
	IS28SS40-0001	SVOA	2,2'-OXYBIS(1-CHLOROPROPANE)
	IS28SS40-0001	SVOA	2-METHYLPHENOL
	IS28SS40-0001	SVOA	HEXACHLOROETHANE
	IS28SS40-0001	SVOA	N-NITROSO-DI-N-PROPYLAMINE
	IS28SS40-0001	SVOA	4-METHYLPHENOL
	IS28SS40-0001	SVOA	DIETHYL PHTHALATE
	IS28SS40-0001	SVOA	NITROBENZENE
	IS28SS40-0001	SVOA	ISOPHORONE
	IS28SS40-0001	SVOA	2-NITROPHENOL
	IS28SS40-0001	SVOA	2,4-DIMETHYLPHENOL
	IS28SS40-0001	SVOA	BIS(2-CHLOROETHOXY) METHANE
	IS28SS40-0001	SVOA	2,4-DICHLOROPHENOL
	IS28SS40-0001	SVOA	NAPHTHALENE
	IS28SS40-0001	SVOA	CAPROLACTAM
	IS28SS40-0001	SVOA	4-CHLOROANILINE
	IS28SS40-0001	SVOA	HEXACHLOROBUTADIENE
	IS28SS40-0001	SVOA	4-CHLORO-3-METHYLPHENOL
	IS28SS40-0001	SVOA	2-METHYLNAPHTHALENE
	IS28SS40-0001	SVOA	HEXACHLOROCYCLOPENTADIENE
	IS28SS40-0001	SVOA	2,4,6-TRICHLOROPHENOL
	IS28SS40-0001	SVOA	2,4,5-TRICHLOROPHENOL
	IS28SS40-0001	SVOA	HEXACHLOROBENZENE
	IS28SS40-0001	SVOA	2-CHLORONAPHTHALENE
	IS28SS40-0001	SVOA	1,1'-Biphenyl
	IS28SS40-0001	SVOA	2-NITROANILINE
	IS28SS40-0001	SVOA	ACENAPHTHYLENE
	IS28SS40-0001	SVOA	DIMETHYL PHTHALATE
	IS28SS40-0001	SVOA	2,6-DINITROTOLUENE
	IS28SS40-0001	SVOA	ANTHRACENE
	IS28SS40-0001	SVOA	3-NITROANILINE
	IS28SS40-0001	SVOA	BENZO[G,H,I]PERYLENE
	IS28SS40-0001	SVOA	CARBAZOLE
	IS28SS40-0001	SVOA	4-NITROPHENOL
	IS28SS40-0001	SVOA	2,4-DINITROTOLUENE
	IS28SS40-0001	SVOA	FLUORENE
	IS28SS40-0001	SVOA	4-CHLOROPHENYL PHENYL ETHER

Table 3-1
Rejected Results

	Sample	Fraction	Compound
RI Data			
	IS28SS40-0001	SVOA	4-NITROANILINE
	IS28SS40-0001	SVOA	4,6-DINITRO-2-METHYLPHENOL
	IS28SS40-0001	SVOA	N-NITROSODIPHENYLAMINE
	IS28SS40-0001	SVOA	ATRAZINE
	IS28SS40-0001	SVOA	BUTYL BENZYL PHTHALATE
	IS28SS40-0001	SVOA	4-BROMOPHENYL PHENYL ETHER
	IS28SS40-0001	SVOA	PENTACHLOROPHENOL
	IS28SS40-0001	SVOA	DIBENZ(A,H)ANTHRACENE
	IS28SS40-0001	SVOA	DI-N-BUTYL PHTHALATE
	IS28SS40-0001	SVOA	3,3'-DICHLOROBENZIDINE
	IS28SS40-0001	SVOA	DI-N-OCTYLPHTHALATE
	IS28SB02-0103	METAL	ANTIMONY
	IS28SB04-0103	METAL	ANTIMONY
	IS28SB08-0103	METAL	ANTIMONY
	IS28SB09-0103	METAL	ANTIMONY
	IS28SB10-0103	METAL	ANTIMONY
	IS28SB11-0103	METAL	ANTIMONY
	IS28SB12-0103	METAL	ANTIMONY
	IS28SB13-0105	METAL	ANTIMONY
	IS28SB13-0105P	METAL	ANTIMONY
	IS28SB15-0103	METAL	ANTIMONY
	IS28SB16-0103	METAL	ANTIMONY
	IS28SB17-0103	METAL	ANTIMONY
	IS28SB18-0103	METAL	ANTIMONY
	IS28SB20-0103	METAL	ANTIMONY
	IS28SB21-0103	METAL	ANTIMONY
	IS28SB21-0103P	METAL	ANTIMONY
	IS28SB22-0103	METAL	ANTIMONY
	IS28SB24-0103	METAL	ANTIMONY
	IS28SB26-0103	METAL	ANTIMONY
	IS28SB32-0103	METAL	ANTIMONY
	IS28SB33-0103	METAL	ANTIMONY
	IS28SB35-0103	METAL	ANTIMONY
	IS28SB36-0103	METAL	ANTIMONY
	IS28SB37-0103	METAL	ANTIMONY
	IS28SB38-0103	METAL	ANTIMONY
	IS28SB40-0103	METAL	ANTIMONY
	IS28SB41-0103	METAL	ANTIMONY
	IS28SB42-0103	METAL	ANTIMONY
	IS28SS05-0001	METAL	ANTIMONY
	IS28SS09-0001	METAL	ANTIMONY
	IS28SS11-0001	METAL	ANTIMONY
	IS28SS11-0001P	METAL	ANTIMONY
	IS28SS13-0001	METAL	ANTIMONY
	IS28SS16-0001	METAL	ANTIMONY
	IS28SS17-0001	METAL	ANTIMONY

Table 3-1
Rejected Results

	Sample	Fraction	Compound
RI Data			
	IS28SS18-0001	METAL	ANTIMONY
	IS28SS20-0001	METAL	ANTIMONY
	IS28SS22-0001	METAL	ANTIMONY
	IS28SS24-0001	METAL	ANTIMONY
	IS28SS26-0001	METAL	ANTIMONY
	IS28SS32-0001	METAL	ANTIMONY
	IS28SS35-0001	METAL	ANTIMONY
	IS28SS36-0001	METAL	ANTIMONY
	IS28SS37-0001	METAL	ANTIMONY
	IS28SS38-0001	METAL	ANTIMONY
	IS28SS41-0001	METAL	ANTIMONY

ATTACHMENT A

Attachment A

Additional Technical Narrative for SDG CTO111-7

Sample WT1184-5 was extracted on May 22 and analyzed for semivolatile organic compounds on June 26, 2003. The analyst performing the analysis noted that the sample had hits for 59 compounds out of 65 reported. The hits were all under the PQL and most of the hits were between 100 and 200 ppb. The analyst performed a reanalysis on June 29, which confirmed that the sample extract contained those compounds. Only the results of the initial sample analysis were reported in the data package submitted to the client on July 3, 2003.

The client called Katahdin Analytical Services in November of 2003 and requested that the laboratory re-review the data for this sample, stating concerns regarding the validity of the hits found, while at the same time recognizing that the compounds detected could, indeed, have been in the original sample aliquot.

The sample was analyzed following USEPA CLP OLM04.2 protocol for semivolatile analysis. As stated in the method, Katahdin spiked the LCS and MS/MSD with a short list of compounds. The laboratory confirmed that the spiking solution used did indeed only contain the short list of compounds.

Katahdin considered the possible origins of contamination within the laboratory. There are two steps in the sample preparation process where contamination could have occurred: extraction and concentration.

In order for contamination to occur, other samples would have to have been extracted and/or concentrated on the same day(s) as the sample in question. A full list of compounds would have to have been used to spike those other samples in order to cause the sample in question to be contaminated with so many compounds. The laboratory confirmed that other samples were extracted and concentrated on the same days as the sample in question. A spiking solution with a full list compounds was used for these samples.

In the extraction process it is not unusual to use the same syringe to introduce one QC spike solution into a QC sample (such as an LCS) and surrogate spike into a field sample. Of course, there is a prescribed rinsing procedure between uses of the syringe, but it is possible that the extraction analyst made a mistake and did not rinse it as prescribed. In the concentration process, after the sample is concentrated, it is transferred to a 1 mL vial using a pipet. This pipet is supposed to be discarded after it is used for one sample. It is possible that a used pipet was not discarded and used in the next sample that was being transferred from the concentration tube to the vial.

In trying to determine whether the sample indeed contained the compounds detected and reported in the original report, Katahdin took the following steps:

* Naphthalene was one of the compounds that was found in the aliquot of the sample that was analyzed for semivolatile organic compounds. Since Naphthalene is sometimes reported as a volatile compound, we re-evaluated the library search that had been performed on the aliquot of the same sample that had been analyzed for volatile organic compounds. Naphthalene was not found in the library search. This result could point to the possibility that the semivolatile aliquot only was contaminated in some way. But since this was a soil sample and it is not uncommon for two different soil aliquots slated for different analyses to not be homogenous, this could also be insignificant.

* If contamination of the semivolatile aliquot had occurred in the laboratory, we would expect to see not only the compounds that were reported, but all compounds in Katahdin's "super spike"

mix. The dichlorobenzenes were not found in the aliquot of the sample that was analyzed for volatile organic compounds during the original analysis. Again, if the contamination of the semivolatile aliquot happened in the laboratory we would expect to see at least the dichlorobenzenes (especially because they are normally "good performers") in the library search file for the semivolatile aliquot. Dichlorobenzenes were not found, but other "super spike" mix compounds (benzyl alcohol and 1,2,4-trichlorobenzene) were. Several other compounds that are in the "super spike" mix were not found, but those are traditionally "poor performers".

In summary, the investigation yielded no conclusive evidence that the origin of the compounds detected in the sample was the laboratory, but, on the other hand, there is no conclusive evidence to discard that possibility.

ATTACHMENT B

ENVIRONMENTAL
Data Services, Inc.

FACSIMILE COVER SHEET

To: Adrian Hanley

Company: CH2M

Fax #: 703-471-1508

From: Nancy Weaver

Project: Indian Head

Date: 1/6/04

No. of Pages: 6 *(including cover page)*

Comments: Per our discussion.

6B Hills Avenue, Concord, NH 03301 • Telephone (603) 226-0118 • Fax (603) 226-0128

Email eds@env-data.com • Web www.env-data.com

ENVIRONMENTAL
Data Services, Inc.

January 6, 2004

Mr. Adrian Hanley
CH2MHill - WDC
13921 Park Center Road
Herndon, Virginia 20171

RE: Indian Head, CTO-111, Sample Rejection due to Laboratory Contamination

Mr. Hanley,

This letter is in reference to SVOC sample IS28SS36-0001, sampled on 05/19/03, analyzed by Katahdin Analytical Services, and validated by Environmental Data Services, Inc. (EDS) on August 7, 2003.

During validation, it was observed that the sample in question was positive for almost every compound at approximately the same concentration. The laboratory was contacted and they confirmed that the sample might have been contaminated from an unknown source in the laboratory. EDS is in agreement with this conclusion considering the site history and the non-detect results of surrounding samples. As a result, all SVOC results for sample IS28SS36-0001 have been rejected.

Please feel free to contact me with any questions or concerns at (603) 226-0118, or email at nweaver@env-data.com.

Sincerely,

Nancy Weaver
Senior Chemist
Environmental Data Services, Inc.

ENVIRONMENTAL
Data Services, Inc.

SEMIVOLATILE ORGANIC COMPOUNDS
USEPA Region III - Level IV Review

Site: Indian Head, CTO-111 SDG #: CTO111-7

Client: CH2M Hill, Inc. Date: August 7, 2003

Laboratory: Katahdin Analytical Services, Westbrook, Maine Reviewer: Christine Garvey

Client Sample ID	Laboratory Sample ID	Matrix
IS28SS41-0001	WT1184-1	Soil
IS28SS41-0001 MS	WT1184-1 MS	Soil
IS28SS41-0001 MSD	WT1184-1 MSD	Soil
IS28SS40-0001	WT1184-2RE	Soil
IS28SS32-0001	WT1184-3	Soil
IS28SS32-0001 MS	WT1184-3 MS	Soil
IS28SS32-0001 MSD	WT1184-3 MSD	Soil
IS28SS38-0001	WT1184-4	Soil
IS28SS36-0001	WT1184-5	Soil
IS28SS35-0001	WT1184-6RA2	Soil
IS28SS33-0001	WT1184-7RA2	Soil
IS28SS37-0001	WT1184-8RA	Soil
IS28SS21-0001	WT1184-9RA2	Soil
IS28SS21-0001P	WT1184-10RA2	Soil
IS28SB41-0103	WT1184-11	Soil
IS28SB40-0103	WT1184-12RA2	Soil
IS28SB32-0103	WT1184-13RA2	Soil
IS28SB38-0103	WT1184-14RA2	Soil
IS28SB36-0103	WT1184-15RA3	Soil
IS28SB35-0103	WT1184-16RA	Soil
IS28SB35-0103 MS	WT1184-16RA MS	Soil
IS28SB35-0103 MSD	WT1184-16RA MSD	Soil
IS28SB33-0103	WT1184-17RA	Soil
IS28SB33-0103P	WT1184-18	Soil
IS28SB37-0103	WT1184-19	Soil
IS28SS40-0001P	WT1184-20	Soil

Holding Times - All samples were extracted within 14 days for soil samples and analyzed within 40 days for all samples with the exception of sample SS40 which was re-extracted 27 days outside of holding time. All results have been qualified (J/R) in this sample.

GC/MS Tuning - All of the DFTPP tunes in the initial and continuing calibrations met the percent relative abundance criteria. No qualifications were required.

Initial Calibration - The initial calibration analyzed on 06/17/03 exhibited acceptable %RSD and mean RRF values. No qualifications were required.

Continuing Calibration - The continuing calibration analyzed on 06/21/03 exhibited high %D values for hexachlorobenzene, 4-nitroaniline and di-n-octylphthalate of 30.0%, 34.7%, and 25.7%, respectively. However, all associated results are non-detect and no qualifications were required.

The continuing calibration analyzed on 06/23/03 exhibited acceptable %D and RRF values. No qualifications were required.

The continuing calibration analyzed on 06/26/03 exhibited a high %D value for caprolactam of 27.5%. Caprolactam has been qualified (J) in sample SS36.

The continuing calibration analyzed on 06/23/03 (1117) exhibited acceptable %D and RRF values. No qualifications were required.

The continuing calibration analyzed on 06/27/03 (1705) exhibited high %D values for 2,4-dinitrophenol, 2-methylnaphthalene, 4,6-dinitro-2-methylphenol and pentachlorophenol of 43.8%, 29.9%, 33.3% and 28.4%, respectively. However, all associated results are non-detect and no qualifications were required.

The continuing calibration analyzed on 06/28/03 (1058) exhibited high %D values for 2-methylnaphthalene, hexachlorobenzene, 4-nitrophenol and 4,6-dinitro-2-methylphenol of 28.9%, 26.3%, 25.3% and 26.8%, respectively. However, all associated results are non-detect and no qualifications were required.

The continuing calibration analyzed on 06/28/03 (1848) exhibited high %D values for 2,2'-oxybis(1-chloropropane), 2-methylnaphthalene and 4-nitrophenol of 42.0%, 34.6% and 25.3%, respectively. However, all associated results are non-detect and no qualifications were required.

Surrogates - All samples exhibited acceptable surrogate recoveries. No qualifications were required.

MS/MSD - MS/MSD sample SS41 exhibited a low MS %R value for n-nitroso-di-n-propylamine of 38%. n-Nitroso-di-n-propylamine has been qualified (UL) in this sample.

MS/MSD sample SS32 exhibited acceptable %R and RPD values. No qualifications were required.

MS/MSD sample SB35 exhibited acceptable %R and RPD values. No qualifications were required.

Laboratory Control Sample - LCS sample WG2366-LCS exhibited acceptable %R values. No qualifications were required.

LCS sample WG2383-LCS exhibited acceptable %R values. No qualifications were required.

LCS/LCSD sample WG2701-LCS/LCSD exhibited acceptable %R and RPD values. No qualifications were required.

Internal Standard (IS) Area Performance - All internal standards met response and retention time (RT) criteria. No qualifications were required.

Method Blank - Method blank WG2366-BLANK (05/22/03) was free of contamination. No qualifications were required.

Method blank WG2701-BLANK (06/25/03) exhibited bis(2-ethylhexyl)phthalate contamination at 57 ug/kg. Bis(2-ethylhexyl)phthalate has been qualified (B) in sample SS40.

Method blank WG2383-BLANK (05/23/03) exhibited bis(2-ethylhexyl)phthalate contamination at 44 ug/kg. Bis(2-ethylhexyl)phthalate has been qualified (B) in samples SB33P, SB37, SS40P, SB32, SB38, SB36 and SB35.

Field, Equipment Blank - Equipment blank IS28EB-051903 (CTO111-8) was free of contamination. No qualifications were required.

Field blank sample FB-052103 (CTO111-9) was free of contamination. No qualifications were required.

Field Duplicates - Field duplicate results are summarized below. No qualifications were required.

Compound	IS28SS40-0001 ug/kg	IS28SS40-0001P ug/kg	RPD
Phenanthrene	100	100	0%
Fluoranthene	180	220	20%
Benzo(a)anthracene	92	120	26%
Chrysene	120	150	22%

Di-n-butylphthalate	ND	54	NC
Indeno(1,2,3-cd)pyrene	50	56	11%
Pyrene	180	190	17%
Benzo(k)fluoranthene	47	65	32%
Benzo(b)fluoranthene	130	170	27%
Benzo(a)pyrene	64	110	52%

Compound	IS28SS21-0001 ug/kg	IS28SS21-0001P ug/kg	RPD
Phenanthrene	41	36	13%
Fluoranthene	120	89	30%
Benzo(a)anthracene	57	60	12%
Chrysene	65	72	10%
Di-n-butylphthalate	ND	62	NC
Indeno(1,2,3-cd)pyrene	42	ND	NC
Pyrene	92	83	10%
Bis(2-ethylhexyl)phthalate	75	330	126%
Benzo(k)fluoranthene	32	ND	NC
Benzo(b)fluoranthene	86	ND	NC
Benzo(a)pyrene	59	44	29%

Compound	IS28SB33-0103 ug/kg	IS28SB33-0103P ug/kg	RPD
Di-n-butylphthalate	39	30	26%

Tentatively Identified Compounds (TICs) - All "unknown" TIC results were qualified (J) with estimated concentrations, all "known" TIC results were qualified (NJ), all TIC results affected by blank contamination were qualified (B), and all laboratory artifacts were crossed out and rejected (R).

Compound Quantitation - Sample IS28SS36-0001 was positive for almost every compound. The laboratory was contacted and confirmed suspected contamination from an unknown source. No action was taken by the reviewer.

Comments - The analyses of environmental samples and quality control samples are valid within the constraints identified with the data quality flags as presented in the continuing calibration, MS/MSD, method blank and TIC sections of this report. Ten percent of the calculations for the samples in this data package were verified for the Level IV validation. The USEPA "Region III Modifications to the National Functional Guidelines for Organic Data Review", September 1994, was used in evaluating the data in this summary report.

Appendix C-1

Appendix C-1
Surface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM02		IS28MM03		IS28MM05		IS28MM06		IS28MM07		IS28MM11		IS28MM11		IS28MM14	
Sample ID	IS28SS02-0001		IS28SS03-0001		IS28SS05-0001		IS28SS06-0001		IS28SS07-0001		IS28SS11-0001		IS28SS11-0001P		IS28SS14-0001	
Sample Date	05/12/03		05/12/03		05/12/03		05/15/03		05/16/03		05/13/03		05/13/03		05/15/03	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
1,1,1-Trichloroethane	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
1,1,2,2-Tetrachloroethane	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
1,1,2-Trichloroethane	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
1,1-Dichloroethane	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
1,1-Dichloroethene	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
1,2,4-Trichlorobenzene	1	B	1	B	0.7	B	12	U	13	U	11	U	13	U	11	U
1,2-Dibromo-3-chloropropane	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
1,2-Dibromoethane	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
1,2-Dichlorobenzene	0.6	B	0.5	B	11	U	12	U	13	U	11	U	13	U	11	U
1,2-Dichloroethane	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
1,2-Dichloroethene (total)	NA		NA		NA		NA		NA		NA		NA		NA	
1,2-Dichloropropane	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
1,3-Dichlorobenzene	0.5	B	13	U	11	U	12	U	13	U	11	U	13	U	11	U
1,4-Dichlorobenzene	0.5	B	0.5	B	11	U	12	U	13	U	11	U	13	U	11	U
2-Butanone	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
2-Hexanone	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
4-Methyl-2-pentanone	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
Acetone	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
Benzene	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
Bromodichloromethane	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
Bromoform	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
Bromomethane	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
Carbon disulfide	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
Carbon tetrachloride	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
Chlorobenzene	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
Chloroethane	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
Chloroform	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
Chloromethane	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
Cumene	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
Cyclohexane	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
Dibromochloromethane	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
Dichlorodifluoromethane(Freon-12)	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U

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Appendix C-1
Surface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM02		IS28MM03		IS28MM05		IS28MM06		IS28MM07		IS28MM11		IS28MM11		IS28MM14	
Sample ID	IS28SS02-0001		IS28SS03-0001		IS28SS05-0001		IS28SS06-0001		IS28SS07-0001		IS28SS11-0001		IS28SS11-0001P		IS28SS14-0001	
Sample Date	05/12/03		05/12/03		05/12/03		05/15/03		05/16/03		05/13/03		05/13/03		05/15/03	
Chemical Name																
Ethylbenzene	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
Methyl acetate	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
Methyl-tert-butyl ether (MTBE)	0.4	J	0.9	J	0.5	J	12	U	13	U	11	U	13	U	11	U
Methylcyclohexane	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
Methylene chloride	12	U	13	U	11	U	0.9	B	13	U	1	B	13	U	11	U
Styrene	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
Tetrachloroethene	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
Toluene	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
Trichloroethene	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
Trichlorofluoromethane(Freon-11)	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
Vinyl chloride	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
Xylene, total	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
cis-1,2-Dichloroethene	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
cis-1,3-Dichloropropene	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
m- and p-Xylene	NA		NA		NA		NA		NA		NA		NA		NA	
o-Xylene	NA		NA		NA		NA		NA		NA		NA		NA	
trans-1,2-Dichloroethene	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
trans-1,3-Dichloropropene	12	U	13	U	11	U	12	U	13	U	11	U	13	U	11	U
Semi-volatile Organic Compounds (UG/KG)																
1,1-Biphenyl	390	U	440	U	370	U	390	U	450	U	430	U	410	U	370	U
2,4,5-Trichlorophenol	990	U	1,100	U	940	U	970	U	1,100	U	1,100	U	1,000	U	940	U
2,4,6-Trichlorophenol	390	U	440	U	370	U	390	U	450	U	430	U	410	U	370	U
2,4-Dichlorophenol	390	U	440	U	370	U	390	U	450	U	430	U	410	U	370	U
2,4-Dimethylphenol	390	U	440	U	370	U	390	U	450	U	430	U	410	U	370	U
2,4-Dinitrophenol	990	U	1,100	U	940	U	970	U	1,100	U	1,100	U	1,000	U	940	U
2,4-Dinitrotoluene	390	U	440	U	370	U	390	U	450	U	430	U	410	U	370	U
2,6-Dinitrotoluene	390	U	440	U	370	U	390	U	450	U	430	U	410	U	370	U
2-Chloronaphthalene	390	U	440	U	370	U	390	U	450	U	430	U	410	U	370	U
2-Chlorophenol	390	U	440	U	370	U	390	U	450	U	430	U	410	U	370	U
2-Methylnaphthalene	390	U	440	U	370	U	390	U	450	U	430	U	410	U	370	U
2-Methylphenol	390	U	440	U	370	U	390	U	450	U	430	U	410	U	370	U
2-Nitroaniline	990	U	1,100	U	940	U	970	U	1,100	U	1,100	U	1,000	U	940	U
2-Nitrophenol	390	U	440	U	370	U	390	U	450	U	430	U	410	U	370	U
3,3'-Dichlorobenzidine	390	U	440	U	370	U	390	U	450	U	430	U	410	U	370	U

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Appendix C-1
Surface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM02	IS28MM03	IS28MM05	IS28MM06	IS28MM07	IS28MM11		IS28MM14
Sample ID	IS28SS02-0001	IS28SS03-0001	IS28SS05-0001	IS28SS06-0001	IS28SS07-0001	IS28SS11-0001	IS28SS11-0001P	IS28SS14-0001
Sample Date	05/12/03	05/12/03	05/12/03	05/15/03	05/16/03	05/13/03	05/13/03	05/15/03
Chemical Name								
3-Nitroaniline	990 U	1,100 U	940 U	970 U	1,100 U	1,100 U	1,000 U	940 U
4,6-Dinitro-2-methylphenol	990 U	1,100 U	940 U	970 U	1,100 U	1,100 U	1,000 U	940 U
4-Bromophenyl-phenylether	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
4-Chloro-3-methylphenol	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
4-Chloroaniline	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
4-Chlorophenyl-phenylether	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
4-Methylphenol	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
4-Nitroaniline	990 U	1,100 U	940 U	970 U	1,100 U	1,100 U	1,000 U	940 U
4-Nitrophenol	990 U	1,100 U	940 U	970 U	1,100 U	1,100 U	1,000 U	940 U
Acenaphthene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Acenaphthylene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Acetophenone	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Anthracene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Atrazine	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Benzaldehyde	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Benzo(a)anthracene	390 U	21 J	370 U	29 J	450 U	430 U	410 U	370 U
Benzo(a)pyrene	390 U	440 U	370 U	32 J	450 U	430 U	410 U	370 U
Benzo(b)fluoranthene	390 U	440 U	370 U	61 J	450 U	430 U	410 U	370 U
Benzo(g,h,i)perylene	390 U	440 U	370 U	28 J	450 U	430 U	410 U	370 U
Benzo(k)fluoranthene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Bis(2-chloro-1-methylethyl) ether	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Butylbenzylphthalate	390 U	440 U	370 U	340 J	450 U	430 U	410 U	50 J
Caprolactam	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Carbazole	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Chrysene	390 U	23 J	370 U	50 J	450 U	430 U	410 U	370 U
Di-n-butylphthalate	60 B	45 B	370 U	410 B	450 U	430 U	410 U	640 B
Di-n-octylphthalate	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Dibenz(a,h)anthracene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Dibenzofuran	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Diethylphthalate	390 U	440 U	370 U	36 J	450 U	430 U	410 U	44 J
Dimethyl phthalate	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Fluoranthene	390 U	34 J	370 U	54 J	450 U	430 U	410 U	370 U
Fluorene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Hexachlorobenzene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Hexachlorobutadiene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U

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Appendix C-1
Surface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM02	IS28MM03	IS28MM05	IS28MM06	IS28MM07	IS28MM11		IS28MM14
Sample ID	IS28SS02-0001	IS28SS03-0001	IS28SS05-0001	IS28SS06-0001	IS28SS07-0001	IS28SS11-0001	IS28SS11-0001P	IS28SS14-0001
Sample Date	05/12/03	05/12/03	05/12/03	05/15/03	05/16/03	05/13/03	05/13/03	05/15/03
Chemical Name								
Hexachlorocyclopentadiene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Hexachloroethane	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Indeno(1,2,3-cd)pyrene	390 U	440 U	370 U	30 J	450 U	430 U	410 U	370 U
Isophorone	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Naphthalene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Nitrobenzene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Pentachlorophenol	990 U	1,100 U	940 U	970 U	1,100 U	1,100 U	1,000 U	940 U
Phenanthrene	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Phenol	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
Pyrene	390 U	31 J	370 U	55 J	450 U	430 U	410 U	370 U
bis(2-Chloroethoxy)methane	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
bis(2-Chloroethyl)ether	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
bis(2-Ethylhexyl)phthalate	390 U	440 U	370 U	120 J	450 U	430 U	410 U	370 U
n-Nitroso-di-n-propylamine	390 U	440 U	370 U	390 U	450 U	430 U	410 U	370 U
n-Nitrosodiphenylamine	390 U	440 U	370 U	750	450 U	430 U	410 U	370 U
Explosives (UG/KG)								
1,3,5-Trinitrobenzene	100 U	100 U	100 U	100 UL	100 U	100 U	670	100 U
1,3-Dinitrobenzene	100 U	100 U	100 U	100 UL	100 UL	100 U	100 U	100 UL
2,4,6-Trinitrotoluene	100 UL	100 UL	100 UL	100 UL	100 UL	100 UL	100 UL	100 UL
2,4-Dinitrotoluene	100 U	100 U	100 U	100 UL	100 U	100 U	100 U	100 U
2,6-Dinitrotoluene	100 U	100 U	100 U	100 UL	100 U	100 U	100 U	100 U
2-Amino-4,6-dinitrotoluene	100 U	100 U	100 U	100 UL	100 U	100 U	100 U	100 U
2-Nitrotoluene	200 U	200 U	200 U	200 UL	200 UL	200 U	200 U	200 UL
3-Nitrotoluene	200 U	200 U	200 U	200 UL	200 U	200 U	200 U	200 U
4-Amino-2,6-dinitrotoluene	100 U	100 U	100 U	100 UL	100 U	100 U	100 U	100 U
4-Nitrotoluene	200 U	200 U	200 U	200 UL	200 U	200 U	200 U	200 U
HMX	200 U	200 U	200 U	200 UL	200 UL	200 U	200 U	200 UL
Nitrobenzene	100 UL	100 UL	100 UL	120 L	100 UL	57 J	100 U	100 UL
Nitroglycerin	6,700 U	6,500 U	5,700 U	5,900 U	7,300 U	6,000 U	6,200 U	5,500 U
Nitroguanidine	130 U	130 U	130 U	130 U	130 U	130 U	130 U	130 U
PETN	500 U	500 UL	500 U	500 U	500 U	500 U	500 U	500 U
Perchlorate	190 U	120 U	40 U	40 U	40 U	40 U	40 U	40 U
RDX	200 U	200 U	200 U	200 UL	200 UL	200 U	200 U	200 UL
Tetryl	200 U	200 U	200 U	200 UL	200 U	200 U	200 U	200 U

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Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM02	IS28MM03	IS28MM05	IS28MM06	IS28MM07	IS28MM11		IS28MM14
Sample ID	IS28SS02-0001	IS28SS03-0001	IS28SS05-0001	IS28SS06-0001	IS28SS07-0001	IS28SS11-0001	IS28SS11-0001P	IS28SS14-0001
Sample Date	05/12/03	05/12/03	05/12/03	05/15/03	05/16/03	05/13/03	05/13/03	05/15/03
Chemical Name								
Total Metals (MG/KG)								
Aluminum	7,830	8,420	4,270	7,510	10,200	3,000	3,770	4,640
Antimony	0.56 B	0.37 B	0.26 R	0.25 U	0.24 U	0.27 R	0.27 R	0.25 U
Arsenic	117	40.4	44.5	137	26.2	85.3 L	73.4 L	5.9
Barium	45.5	92.5	27.7 J	63.5	58.8	31.8 J	37.3 J	28.3 J
Beryllium	0.42 B	0.39 B	0.14 B	0.35 B	0.4 B	0.21 B	0.29 B	0.13 B
Cadmium	1 K	1.3 K	23.9	17.2	0.95 K	25.9	19.7	6.3
Calcium	174 J	8,330	195 J	753 J	3,200	576 J	977 J	1,180
Chromium	8.3 K	31.9	6.1	12.5	21.4	9.8	7.2	8.4
Cobalt	5.8 J	4.4 J	1.6 J	4.3 J	3.4 J	2.4 J	2.2 J	2.2 J
Copper	5.3 K	28	35.4	98.4	15.6	64.6	53	33.4
Iron	8,470	15,700	4,350	15,700	15,800	8,350	11,100	6,840
Lead	31.2	41.4	288	430	22.8	731	836	189
Magnesium	547 J	883 J	258 J	648 J	927	224 J	279 J	318 J
Manganese	370	378	42.2	151	122	63.1	50.3	57.3
Mercury	0.08 B	0.06 B	0.02 B	0.31	0.21	0.08 B	0.06 B	0.07 B
Nickel	7.7 K	8 J	2.33 U	9.4 B	10.4 B	4 J	4.4 J	5.8 B
Potassium	410 J	282 J	235 J	623 B	336 B	188 J	267 J	225 B
Selenium	0.46 B	0.73 B	0.83 B	0.39 U	0.38 U	0.43 U	0.46 J	0.4 U
Silver	0.7 B	4.7 B	0.95 U	0.9 U	1.6 B	0.98 U	1 J	0.91 U
Sodium	17.8 B	32.3 B	21.4 B	28.3 B	40.4 B	31.6 B	38.9 B	20.9 B
Thallium	0.87 B	0.65 B	0.83 B	0.56 U	0.54 U	0.65 B	0.61 B	0.61 B
Vanadium	15.4	32.7	12.4 K	20	31.3	18.2 K	26.2	13.7 K
Zinc	193	506	11,800	8,650	281	17,200	23,700	5,060
Wet Chemistry (MG/KG)								
% Solids	75	76	88	85	68	83	81	90
Total organic carbon (TOC)	9,600	34,000	2,800	13,000	17,000	15,000	13,000	16,000
pH	6.7	7.8	10	7.5	6.9	7.2	7	7.4

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Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM20		IS28MM23		IS28MM28		IS28MM42		IS28SO04		IS28SO04		IS28SO08		IS28SO09	
Sample ID	IS28SS20-0001		IS28SS23-0001		IS28SS28-0001		IS28SS42-0001		IS28SS04-0001		IS28SS04-0001P		IS28SS08-0001		IS28SS09-0001	
Sample Date	05/20/03		05/15/03		05/20/03		05/14/03		05/20/03		05/20/03		05/13/03		05/12/03	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
1,1,1-Trichloroethane	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
1,1,2,2-Tetrachloroethane	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
1,1,2-Trichloroethane	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
1,1-Dichloroethane	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
1,1-Dichloroethene	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
1,2,4-Trichlorobenzene	10	U	14	U	20	UL	12	U	13	UJ	12	U	0.6	B	0.6	B
1,2-Dibromo-3-chloropropane	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
1,2-Dibromoethane	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
1,2-Dichlorobenzene	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
1,2-Dichloroethane	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
1,2-Dichloroethene (total)	10	U	NA		2	L	NA		13	UJ	12	U	NA		NA	
1,2-Dichloropropane	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
1,3-Dichlorobenzene	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
1,4-Dichlorobenzene	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
2-Butanone	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
2-Hexanone	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
4-Methyl-2-pentanone	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
Acetone	1	B	14	U	17	B	12	U	13	UJ	3	B	14	U	11	U
Benzene	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
Bromodichloromethane	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
Bromoform	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
Bromomethane	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
Carbon disulfide	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
Carbon tetrachloride	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
Chlorobenzene	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
Chloroethane	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
Chloroform	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
Chloromethane	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
Cumene	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
Cyclohexane	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
Dibromochloromethane	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
Dichlorodifluoromethane(Freon-12)	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U

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Appendix C-1
Surface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM20		IS28MM23		IS28MM28		IS28MM42		IS28SO04		IS28SO04		IS28SO08		IS28SO09	
Sample ID	IS28SS20-0001		IS28SS23-0001		IS28SS28-0001		IS28SS42-0001		IS28SS04-0001		IS28SS04-0001P		IS28SS08-0001		IS28SS09-0001	
Sample Date	05/20/03		05/15/03		05/20/03		05/14/03		05/20/03		05/20/03		05/13/03		05/12/03	
Chemical Name																
Ethylbenzene	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
Methyl acetate	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
Methyl-tert-butyl ether (MTBE)	10	U	14	U	3	L	12	U	3	J	12	U	1	J	11	U
Methylcyclohexane	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
Methylene chloride	7	B	14	U	14	B	12	U	8	B	6	B	14	U	0.9	B
Styrene	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
Tetrachloroethene	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
Toluene	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
Trichloroethene	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
Trichlorofluoromethane(Freon-11)	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
Vinyl chloride	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
Xylene, total	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
cis-1,2-Dichloroethene	10	U	14	U	2	L	12	U	13	UJ	12	U	14	U	11	U
cis-1,3-Dichloropropene	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
m- and p-Xylene	10	U	NA		20	UL	NA		13	UJ	12	U	NA		NA	
o-Xylene	10	U	NA		20	UL	NA		13	UJ	12	U	NA		NA	
trans-1,2-Dichloroethene	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
trans-1,3-Dichloropropene	10	U	14	U	20	UL	12	U	13	UJ	12	U	14	U	11	U
Semi-volatile Organic Compounds (UG/KG)																
1,1-Biphenyl	380	U	430	U	690	U	2,100	U	430	U	430	U	400	U	370	U
2,4,5-Trichlorophenol	960	U	1,100	U	1,700	U	5,200	U	1,100	U	1,100	U	1,000	U	940	U
2,4,6-Trichlorophenol	380	U	430	U	690	U	2,100	U	430	U	430	U	400	U	370	U
2,4-Dichlorophenol	380	U	430	U	690	U	2,100	U	430	U	430	U	400	U	370	U
2,4-Dimethylphenol	380	U	430	U	690	U	2,100	U	430	U	430	U	400	U	370	U
2,4-Dinitrophenol	960	U	1,100	U	1,700	U	5,200	U	1,100	U	1,100	U	1,000	U	940	U
2,4-Dinitrotoluene	380	U	430	U	690	U	2,100	U	430	U	430	U	400	U	370	U
2,6-Dinitrotoluene	380	U	430	U	690	U	2,100	U	430	U	430	U	400	U	370	U
2-Chloronaphthalene	380	U	430	U	690	U	2,100	U	430	U	430	U	400	U	370	U
2-Chlorophenol	380	U	430	U	690	U	2,100	U	430	U	430	U	400	U	370	U
2-Methylnaphthalene	380	U	430	U	690	U	2,100	U	430	U	430	U	400	U	370	U
2-Methylphenol	380	U	430	U	690	U	2,100	U	430	U	430	U	400	U	370	U
2-Nitroaniline	960	U	1,100	U	1,700	U	5,200	U	1,100	U	1,100	U	1,000	U	940	U
2-Nitrophenol	380	U	430	U	690	U	2,100	U	430	U	430	U	400	U	370	U
3,3'-Dichlorobenzidine	380	U	430	U	690	U	2,100	U	430	U	430	U	400	U	370	U

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Remedial Investigation Report Site 28
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Station ID	IS28MM20	IS28MM23	IS28MM28	IS28MM42	IS28SO04		IS28SO08	IS28SO09
Sample ID	IS28SS20-0001	IS28SS23-0001	IS28SS28-0001	IS28SS42-0001	IS28SS04-0001	IS28SS04-0001P	IS28SS08-0001	IS28SS09-0001
Sample Date	05/20/03	05/15/03	05/20/03	05/14/03	05/20/03	05/20/03	05/13/03	05/12/03
Chemical Name								
3-Nitroaniline	960 U	1,100 U	1,700 U	5,200 U	1,100 U	1,100 U	1,000 U	940 U
4,6-Dinitro-2-methylphenol	960 U	1,100 U	1,700 U	5,200 U	1,100 U	1,100 U	1,000 U	940 U
4-Bromophenyl-phenylether	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
4-Chloro-3-methylphenol	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
4-Chloroaniline	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
4-Chlorophenyl-phenylether	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
4-Methylphenol	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
4-Nitroaniline	960 U	1,100 U	1,700 U	5,200 U	1,100 U	1,100 U	1,000 U	940 U
4-Nitrophenol	960 U	1,100 U	1,700 U	5,200 U	1,100 U	1,100 U	1,000 U	940 U
Acenaphthene	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Acenaphthylene	380 U	22 J	690 U	2,100 U	430 U	430 U	400 U	370 U
Acetophenone	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Anthracene	380 U	35 J	690 U	2,100 U	430 U	430 U	400 U	370 U
Atrazine	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Benzaldehyde	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Benzo(a)anthracene	380 U	200 J	37 J	130 J	430 U	430 U	43 J	23 J
Benzo(a)pyrene	380 U	220 J	36 J	160 J	430 U	430 U	45 J	370 U
Benzo(b)fluoranthene	380 U	330 J	60 J	180 J	30 J	430 U	98 J	39 J
Benzo(g,h,i)perylene	380 U	140 J	690 U	540 J	430 U	430 U	400 U	370 U
Benzo(k)fluoranthene	380 U	130 J	690 U	97 J	430 U	430 U	41 J	19 J
Bis(2-chloro-1-methylethyl) ether	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Butylbenzylphthalate	110 J	430 U	690 U	2,100 U	430 U	430 U	45 J	370 U
Caprolactam	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Carbazole	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Chrysene	380 U	260 J	43 J	130 J	25 J	430 U	58 J	30 J
Di-n-butylphthalate	550	36 B	37 J	2,100 U	430 U	430 U	98 B	370 U
Di-n-octylphthalate	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Dibenz(a,h)anthracene	380 U	57 J	690 U	500 J	430 U	430 U	400 U	370 U
Dibenzofuran	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Diethylphthalate	37 J	23 J	690 U	2,100 U	430 U	430 U	400 U	370 U
Dimethyl phthalate	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Fluoranthene	380 U	380 J	81 J	150 J	38 J	430 U	75 J	26 J
Fluorene	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Hexachlorobenzene	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Hexachlorobutadiene	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U

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Station ID	IS28MM20	IS28MM23	IS28MM28	IS28MM42	IS28SO04		IS28SO08	IS28SO09
Sample ID	IS28SS20-0001	IS28SS23-0001	IS28SS28-0001	IS28SS42-0001	IS28SS04-0001	IS28SS04-0001P	IS28SS08-0001	IS28SS09-0001
Sample Date	05/20/03	05/15/03	05/20/03	05/14/03	05/20/03	05/20/03	05/13/03	05/12/03
Chemical Name								
Hexachlorocyclopentadiene	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Hexachloroethane	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Indeno(1,2,3-cd)pyrene	380 U	220 J	690 U	530 J	430 U	430 U	44 J	370 U
Isophorone	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Naphthalene	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Nitrobenzene	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Pentachlorophenol	960 U	1,100 U	1,700 U	5,200 U	1,100 U	1,100 U	1,000 U	940 U
Phenanthrene	380 U	140 J	38 J	68 J	430 U	430 U	400 U	370 U
Phenol	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
Pyrene	380 U	410 J	71 J	190 J	33 J	430 U	68 J	28 J
bis(2-Chloroethoxy)methane	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
bis(2-Chloroethyl)ether	380 U	430 U	690 U	2,100 U	430 U	430 U	400 U	370 U
bis(2-Ethylhexyl)phthalate	78 B	430 U	190 B	220 J	110 B	99 B	100 B	370 U
n-Nitroso-di-n-propylamine	380 UL	430 U	690 UL	2,100 U	430 UL	430 UL	400 U	370 U
n-Nitrosodiphenylamine	380 U	430 U	690 U	320 J	430 U	430 U	180 J	370 U
Explosives (UG/KG)								
1,3,5-Trinitrobenzene	100 U	100 U	100 U	100 UL	100 U	100 U	100 U	100 U
1,3-Dinitrobenzene	100 U	100 UL	100 U	100 UL	100 U	100 U	100 U	100 U
2,4,6-Trinitrotoluene	100 U	100 UL	100 U	340 L	100 U	100 U	100 UL	100 UL
2,4-Dinitrotoluene	100 U	100 U	100 U	130 L	100 U	100 U	100 U	100 U
2,6-Dinitrotoluene	100 U	100 U	100 U	100 UL	100 U	100 U	100 U	100 U
2-Amino-4,6-dinitrotoluene	100 U	100 U	100 U	100 UL	100 U	100 U	100 U	100 U
2-Nitrotoluene	200 U	200 UL	200 U	200 UL	200 U	200 U	200 U	200 U
3-Nitrotoluene	200 U	200 U	200 U	200 UL	200 U	200 U	200 U	200 U
4-Amino-2,6-dinitrotoluene	100 U	100 U	100 U	100 UL	100 U	100 U	100 U	100 U
4-Nitrotoluene	200 U	200 U	200 U	200 UL	200 U	200 U	200 U	200 U
HMX	200 U	200 UL	200 U	200 UL	200 U	200 U	200 U	200 U
Nitrobenzene	97 J	100 UL	100 U	190 L	100 U	100 U	100 U	100 UL
Nitroglycerin	5,600 U	6,700 U	8,300 U	6,100 U	6,700 U	6,700 U	6,400 U	5,500 U
Nitroguanidine	130 U	130 U	130 U	130 U	130 U	130 U	130 U	130 U
PETN	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U
Perchlorate	40 U	40 U	40 U	40 U	40 U	40 U	110 U	79 U
RDX	200 U	200 UL	200 U	200 UL	200 U	200 U	200 U	200 U
Tetryl	200 U	200 U	200 U	200 UL	200 U	200 U	200 U	200 U

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Station ID	IS28MM20	IS28MM23	IS28MM28	IS28MM42	IS28SO04		IS28SO08	IS28SO09
Sample ID	IS28SS20-0001	IS28SS23-0001	IS28SS28-0001	IS28SS42-0001	IS28SS04-0001	IS28SS04-0001P	IS28SS08-0001	IS28SS09-0001
Sample Date	05/20/03	05/15/03	05/20/03	05/14/03	05/20/03	05/20/03	05/13/03	05/12/03
Chemical Name								
Total Metals (MG/KG)								
Aluminum	2,300 J	5,190	6,900 J	6,760	4,690 J	5,100 J	4,020	5,340
Antimony	0.25 R	0.49 B	1.1 B	2 J	5.3 B	3.9 J	0.86 J	0.26 R
Arsenic	53.8 L	45.3	303 L	35.2 L	377 L	213 L	99.3 L	25.2
Barium	44.9	62	49.4 J	511	43.2 J	44.2	395	38.8 J
Beryllium	0.12 B	0.27 B	0.29 B	0.24 B	0.25 B	0.19 B	0.21 B	0.28 B
Cadmium	3.7	10	0.32 J	45	1.2 K	0.96 J	80	26.5
Calcium	248 J	960 J	443 J	1,910	448 J	389 J	1,460	226 J
Chromium	3.7 J	9	8.2 J	24.1	6.5 J	6.6 J	18.8	9.2
Cobalt	0.97 J	5.4 J	4.8 J	5.2 J	4 J	3.1 J	3.4 J	3.2 J
Copper	7.2 K	29.5	13.8 K	370	14.1	13.7	460	24.8
Iron	5,280	16,600	13,500	21,400	9,300	5,530	16,000	17,900
Lead	23.4 K	346	56.5 K	2,800	160 K	115 K	3,540 J	526
Magnesium	145 J	421 J	567 J	1,720	344 J	377 J	699 J	455 J
Manganese	22.5 J	251	38 J	273	104 J	71.4 J	202 J	112
Mercury	0.09 B	0.25	0.18 B	1.1	0.09 B	0.09 B	0.31	0.12 K
Nickel	2.18 U	8.4 B	4.5 J	39.4	4.8 J	2.9 J	14.8 K	5.7 J
Potassium	235 J	331 B	706 J	414 J	318 J	340 J	357 J	306 J
Selenium	0.39 U	0.47 U	0.78 U	0.33 J	0.61 B	0.44 U	0.44 U	0.79 B
Silver	0.89 U	1.07 U	1.78 U	0.94 J	1.11 U	1 U	1.7 J	0.93 U
Sodium	33.2 B	27 B	41.5 B	40.3 B	34.3 B	36.2 B	42.5 B	33.7 B
Thallium	0.55 UL	0.67 U	1.11 UL	0.42 U	0.69 UL	0.62 UL	0.97 B	0.58 U
Vanadium	9.8 J	17.4 K	24.8 J	20.4	13 J	11.4 J	16.2 K	16.2 K
Zinc	1,450	3,940	95.5	20,900	358	319	71,900 L	21,600
Wet Chemistry (MG/KG)								
% Solids	89	75	61	82	75	75	79	90
Total organic carbon (TOC)	8,000	39,000	78,000	49,000	25,000	21,000	22,000	5,800
pH	6.4	6.9	4.3	6.8	6.2	5.9	7.1	7.6

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Station ID	IS28SO10		IS28SO12		IS28SO13		IS28SO15		IS28SO17		IS28SO18		IS28SO19		IS28	
Sample ID	IS28SS10-0001		IS28SS12-0001		IS28SS13-0001		IS28SS15-0001		IS28SS17-0001		IS28SS18-0001		IS28SS19-0001		IS28SS21-0001	
Sample Date	05/13/03		05/20/03		05/13/03		05/13/03		05/12/03		05/13/03		05/13/03		05/19/03	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
1,1,1-Trichloroethane	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
1,1,2,2-Tetrachloroethane	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
1,1,2-Trichloro-1,2.2-trifluoroethane(Freon-113)	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
1,1,2-Trichloroethane	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
1,1-Dichloroethane	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
1,1-Dichloroethene	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
1,2,4-Trichlorobenzene	0.5	B	15	UL	13	U	0.5	B	0.5	B	13	U	0.5	B	17	UL
1,2-Dibromo-3-chloropropane	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
1,2-Dibromoethane	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
1,2-Dichlorobenzene	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
1,2-Dichloroethane	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
1,2-Dichloroethene (total)	NA		2	L	NA		NA		NA		NA		NA		2	L
1,2-Dichloropropane	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
1,3-Dichlorobenzene	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
1,4-Dichlorobenzene	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
2-Butanone	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
2-Hexanone	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
4-Methyl-2-pentanone	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
Acetone	14	U	2	B	13	U	13	U	12	U	13	U	13	U	2	B
Benzene	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
Bromodichloromethane	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
Bromoform	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
Bromomethane	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
Carbon disulfide	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
Carbon tetrachloride	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
Chlorobenzene	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
Chloroethane	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
Chloroform	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
Chloromethane	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
Cumene	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
Cyclohexane	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
Dibromochloromethane	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL
Dichlorodifluoromethane(Freon-12)	14	U	15	UL	13	U	13	U	12	U	13	U	13	U	17	UL

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Station ID	IS28SO10	IS28SO12	IS28SO13	IS28SO15	IS28SO17	IS28SO18	IS28SO19	IS28
Sample ID	IS28SS10-0001	IS28SS12-0001	IS28SS13-0001	IS28SS15-0001	IS28SS17-0001	IS28SS18-0001	IS28SS19-0001	IS28SS21-0001
Sample Date	05/13/03	05/20/03	05/13/03	05/13/03	05/12/03	05/13/03	05/13/03	05/19/03
Chemical Name								
Ethylbenzene	14 U	15 UL	13 U	13 U	12 U	13 U	13 U	17 UL
Methyl acetate	14 U	15 UL	13 U	13 U	12 U	13 U	13 U	17 UL
Methyl-tert-butyl ether (MTBE)	0.4 J	15 UL	1 J	13 U	12 U	13 U	2 J	6 L
Methylcyclohexane	14 U	15 UL	13 U	13 U	12 U	13 U	13 U	17 UL
Methylene chloride	14 U	9 B	13 U	1 B	12 U	13 U	4 B	31 B
Styrene	14 U	15 UL	13 U	13 U	12 U	13 U	13 U	17 UL
Tetrachloroethene	14 U	15 UL	13 U	13 U	12 U	13 U	13 U	17 UL
Toluene	14 U	15 UL	13 U	13 U	12 U	13 U	13 U	17 UL
Trichloroethene	14 U	15 UL	13 U	13 U	12 U	13 U	13 U	17 UL
Trichlorofluoromethane(Freon-11)	14 U	15 UL	13 U	13 U	12 U	13 U	13 U	17 UL
Vinyl chloride	14 U	15 UL	13 U	13 U	12 U	13 U	13 U	17 UL
Xylene, total	14 U	15 UL	13 U	13 U	12 U	13 U	13 U	17 UL
cis-1,2-Dichloroethene	14 U	2 L	13 U	13 U	12 U	13 U	13 U	2 L
cis-1,3-Dichloropropene	14 U	15 UL	13 U	13 U	12 U	13 U	13 U	17 UL
m- and p-Xylene	NA	15 UL	NA	NA	NA	NA	NA	17 UL
o-Xylene	NA	15 UL	NA	NA	NA	NA	NA	17 UL
trans-1,2-Dichloroethene	14 U	15 UL	13 U	13 U	12 U	13 U	13 U	17 UL
trans-1,3-Dichloropropene	14 U	15 UL	13 U	13 U	12 U	13 U	13 U	17 UL
Semi-volatile Organic Compounds (UG/KG)								
1,1-Biphenyl	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
2,4,5-Trichlorophenol	1,300 U	1,200 U	1,100 U	1,000 U	1,000 U	1,100 U	6,000 U	1,500 U
2,4,6-Trichlorophenol	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
2,4-Dichlorophenol	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
2,4-Dimethylphenol	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
2,4-Dinitrophenol	1,300 U	1,200 U	1,100 U	1,000 U	1,000 U	1,100 U	6,000 U	1,500 U
2,4-Dinitrotoluene	1,200	480 U	450 U	170 J	400 U	420 U	2,400 U	590 U
2,6-Dinitrotoluene	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
2-Chloronaphthalene	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
2-Chlorophenol	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
2-Methylnaphthalene	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
2-Methylphenol	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
2-Nitroaniline	1,300 U	1,200 U	1,100 U	1,000 U	1,000 U	1,100 U	6,000 U	1,500 U
2-Nitrophenol	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
3,3'-Dichlorobenzidine	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U

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Appendix C-1
Surface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SO10	IS28SO12	IS28SO13	IS28SO15	IS28SO17	IS28SO18	IS28SO19	IS28
Sample ID	IS28SS10-0001	IS28SS12-0001	IS28SS13-0001	IS28SS15-0001	IS28SS17-0001	IS28SS18-0001	IS28SS19-0001	IS28SS21-0001
Sample Date	05/13/03	05/20/03	05/13/03	05/13/03	05/12/03	05/13/03	05/13/03	05/19/03
Chemical Name								
3-Nitroaniline	1,300 U	1,200 U	1,100 U	1,000 U	1,000 U	1,100 U	6,000 U	1,500 U
4,6-Dinitro-2-methylphenol	1,300 U	1,200 U	1,100 U	1,000 U	1,000 U	1,100 U	6,000 U	1,500 U
4-Bromophenyl-phenylether	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
4-Chloro-3-methylphenol	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
4-Chloroaniline	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
4-Chlorophenyl-phenylether	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
4-Methylphenol	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
4-Nitroaniline	1,300 U	1,200 U	1,100 U	1,000 U	1,000 U	1,100 U	6,000 U	1,500 U
4-Nitrophenol	1,300 U	1,200 U	1,100 U	1,000 U	1,000 U	1,100 U	6,000 U	1,500 U
Acenaphthene	500 U	480 U	450 U	420 U	25 J	420 U	2,400 U	590 U
Acenaphthylene	500 U	480 U	450 U	420 U	28 J	22 J	2,400 U	590 U
Acetophenone	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Anthracene	500 U	480 U	450 U	420 U	400 U	44 J	2,400 U	590 U
Atrazine	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Benzaldehyde	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Benzo(a)anthracene	69 J	480 U	110 J	540	190 J	170 J	2,400 U	57 J
Benzo(a)pyrene	75 J	480 U	160 J	810	210 J	130 J	2,400 U	59 J
Benzo(b)fluoranthene	120 J	480 U	180 J	1,700	360 J	300 J	2,400 U	86 J
Benzo(g,h,i)perylene	500 U	480 U	450 U	420 U	140 J	56 J	2,400 U	590 U
Benzo(k)fluoranthene	47 J	480 U	100 J	660	140 J	150 J	2,400 U	32 J
Bis(2-chloro-1-methylethyl) ether	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Butylbenzylphthalate	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Caprolactam	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Carbazole	500 U	480 U	450 U	22 J	40 J	420 U	2,400 U	590 U
Chrysene	90 J	480 U	140 J	620	330 J	210 J	2,400 U	65 J
Di-n-butylphthalate	160 B	480 U	30 B	230 B	42 B	28 B	1,100 B	590 U
Di-n-octylphthalate	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Dibenz(a,h)anthracene	500 U	480 U	32 J	230 J	43 J	32 J	2,400 U	590 U
Dibenzofuran	500 U	480 U	450 U	420 U	52 J	420 U	2,400 U	590 U
Diethylphthalate	500 U	480 U	450 U	420 U	400 U	420 U	160 J	590 U
Dimethyl phthalate	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Fluoranthene	120 J	480 U	140 J	380 J	850	260 J	2,400 U	120 J
Fluorene	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Hexachlorobenzene	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Hexachlorobutadiene	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U

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Appendix C-1
Surface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SO10	IS28SO12	IS28SO13	IS28SO15	IS28SO17	IS28SO18	IS28SO19	IS28
Sample ID	IS28SS10-0001	IS28SS12-0001	IS28SS13-0001	IS28SS15-0001	IS28SS17-0001	IS28SS18-0001	IS28SS19-0001	IS28SS21-0001
Sample Date	05/13/03	05/20/03	05/13/03	05/13/03	05/12/03	05/13/03	05/13/03	05/19/03
Chemical Name								
Hexachlorocyclopentadiene	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Hexachloroethane	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Indeno(1,2,3-cd)pyrene	74 J	480 U	130 J	1,100	160 J	120 J	2,400 U	42 J
Isophorone	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Naphthalene	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Nitrobenzene	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Pentachlorophenol	1,300 U	1,200 U	1,100 U	1,000 U	1,000 U	1,100 U	6,000 U	1,500 U
Phenanthrene	46 J	480 U	35 J	79 J	740	26 J	2,400 U	41 J
Phenol	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
Pyrene	110 J	480 U	150 J	340 J	550	250 J	2,400 U	92 J
bis(2-Chloroethoxy)methane	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
bis(2-Chloroethyl)ether	500 U	480 U	450 U	420 U	400 U	420 U	2,400 U	590 U
bis(2-Ethylhexyl)phthalate	110 B	140 B	120 B	260 B	400 U	420 U	440 B	75 J
n-Nitroso-di-n-propylamine	500 U	480 UL	450 U	420 U	400 U	420 U	2,400 U	590 U
n-Nitrosodiphenylamine	160 J	480 U	450 U	610	23 J	81 J	12,000	590 U
Explosives (UG/KG)								
1,3,5-Trinitrobenzene	100 U	100 U	100 U	100 U	100 U	100 U	100 UL	100 UL
1,3-Dinitrobenzene	100 U	100 U	100 U	100 U	100 U	100 U	100 UL	100 U
2,4,6-Trinitrotoluene	100 UL	100 U	100 UL	290 L	100 UL	100 UL	100 UL	100 U
2,4-Dinitrotoluene	100 U	100 U	100 U	79 J	100 U	100 U	220 L	100 U
2,6-Dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 UL	100 U
2-Amino-4,6-dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 UL	100 U
2-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 UL	200 U
3-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 UL	200 U
4-Amino-2,6-dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 UL	100 U
4-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 UL	200 U
HMX	200 U	200 U	200 U	200 U	200 U	200 U	200 UL	200 U
Nitrobenzene	100 U	68 J	100 U	67 J	100 UL	100 U	150 L	100 U
Nitroglycerin	7,600 U	6,300 U	7,000 U	6,300 U	5,500 U	6,500 U	6,000 U	9,500 U
Nitroguanidine	130 U	130 U	130 U	130 U	130 U	130 U	130 U	130 U
PETN	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U
Perchlorate	200 U	40 U	430 U	150 U	120 U	40 U	190 U	42 U
RDX	200 U	200 U	200 U	200 U	200 U	200 U	200 UL	200 U
Tetryl	200 U	200 U	200 U	200 U	200 U	200 U	200 UL	200 UL

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Appendix C-1
Surface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SO10	IS28SO12	IS28SO13	IS28SO15	IS28SO17	IS28SO18	IS28SO19	IS28
Sample ID	IS28SS10-0001	IS28SS12-0001	IS28SS13-0001	IS28SS15-0001	IS28SS17-0001	IS28SS18-0001	IS28SS19-0001	IS28SS21-0001
Sample Date	05/13/03	05/20/03	05/13/03	05/13/03	05/12/03	05/13/03	05/13/03	05/19/03
Chemical Name								
Total Metals (MG/KG)								
Aluminum	7,720	8,050 J	9,550	6,140	6,700	3,560	9,060	4,450
Antimony	0.67 J	0.33 B	0.3 R	2.8 J	0.29 R	0.23 R	18.3 L	1.9 B
Arsenic	18.4 L	6.8 L	15.6 L	10.5 L	30.3	145 L	29 L	284 L
Barium	169	48.6 J	118	935	46.7	193	1,550	137
Beryllium	0.15 U	0.6 J	0.19 B	0.12 B	0.24 B	0.18 B	0.24 B	0.35 B
Cadmium	31.8	0.07 U	9.8	36.7	13.2	57.2	141	2.5 K
Calcium	23,500	1,180 J	23,400	1,760	1,160	327 J	8,470	3,880
Chromium	72.6	13.7 J	66.3	36.4	14.7	11.6	169	10.2 J
Cobalt	5.8 J	2.5 J	5.2 J	3.2 J	3.2 J	8.8 K	6.2 J	5.6 J
Copper	155	19.3	205	799	33.8	252	1,270	27.1
Iron	84,600	44,400	27,600	41,000	13,500	32,400	36,200	12,600
Lead	1,180 J	10.7 K	282 J	3,650 J	259	1,990	10,300 J	157
Magnesium	1,360 J	770 J	1,270	2,160	774 J	481 J	2,580	1,610
Manganese	711 J	25.1 J	393 J	333 J	93.6	459	475 J	533
Mercury	1.3	0.09 B	0.99	11.5	0.29	0.19 B	0.84	0.24
Nickel	20.6 K	2.94 U	15.5 K	31.4	12.5 K	10.2 K	44.1	10.4 J
Potassium	371 J	459 J	484 J	540 J	508 J	234 J	833 J	621 J
Selenium	1.3 J	0.53 U	1.1 K	0.58 J	0.55 B	0.66 J	0.44 U	0.63 J
Silver	16.1	1.2 U	11	3.6 K	1.3 B	0.96 J	4.8	1.4 U
Sodium	99.3 B	66.2 B	57.7 B	58.8 B	27.3 B	36.4 B	141 B	98.8 J
Thallium	1.46 U	1.4 B	0.81 B	0.63 U	0.65 U	0.51 U	0.62 U	0.87 U
Vanadium	70.4	50.2 J	59.8	22.1	22 K	11.4 K	24.8	21.5 K
Zinc	13,400 L	927	5,760 L	22,600 L	6,120	48,200	63,200 L	796
Wet Chemistry (MG/KG)								
% Solids	66	79	71	80	91	77	84	53
Total organic carbon (TOC)	62,000	7,400	69,000	26,000	17,000	19,000	72,000	90,000
pH	7.5	6	7.8	6.5	7.4	6.4	7.4	6.5

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IHDIV-NSWC

Station ID	SO21		IS28SO22		IS28SO24		IS28SO26		IS28SO27		IS28SO29		IS28SO32		IS28SO33	
Sample ID	IS28SS21-0001P		IS28SS22-0001		IS28SS24-0001		IS28SS26-0001		IS28SS27-0001		IS28SS29-0001		IS28SS32-0001		IS28SS33-0001	
Sample Date	05/19/03		05/14/03		05/14/03		05/19/03		05/16/03		05/19/03		05/19/03		05/19/03	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
1,1,1-Trichloroethane	18	U	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UL
1,1,2,2-Tetrachloroethane	18	UJ	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UJ
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	18	U	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UL
1,1,2-Trichloroethane	18	U	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UL
1,1-Dichloroethane	18	U	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UL
1,1-Dichloroethene	18	U	13	U	12	U	12	UL	13	U	13	UL	18	UL	22	UL
1,2,4-Trichlorobenzene	18	UJ	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UJ
1,2-Dibromo-3-chloropropane	18	UJ	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UJ
1,2-Dibromoethane	18	U	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UL
1,2-Dichlorobenzene	18	UJ	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UJ
1,2-Dichloroethane	18	U	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UL
1,2-Dichloroethene (total)	2	J	NA		NA		2	L	NA		1	L	4	B	3	L
1,2-Dichloropropane	18	U	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UL
1,3-Dichlorobenzene	18	UJ	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UJ
1,4-Dichlorobenzene	18	UJ	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UJ
2-Butanone	18	U	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UL
2-Hexanone	18	UJ	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UJ
4-Methyl-2-pentanone	18	UJ	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UJ
Acetone	3	B	13	U	12	U	12	UJ	13	U	14	B	8	B	4	B
Benzene	18	U	13	U	12	U	12	UL	13	U	13	UL	18	UL	22	UL
Bromodichloromethane	18	U	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UL
Bromoform	18	UJ	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UJ
Bromomethane	18	U	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UL
Carbon disulfide	18	U	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UL
Carbon tetrachloride	18	U	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UL
Chlorobenzene	18	UJ	13	U	12	U	12	UL	13	U	13	UL	18	UL	22	UJ
Chloroethane	18	U	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UL
Chloroform	18	U	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UL
Chloromethane	18	U	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UL
Cumene	18	UJ	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UJ
Cyclohexane	18	U	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UL
Dibromochloromethane	18	U	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UL
Dichlorodifluoromethane(Freon-12)	18	U	13	U	12	U	12	UL	13	U	13	UL	18	UJ	22	UL

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IHDIV-NSWC

Station ID	SO21		IS28SO22		IS28SO24		IS28SO26		IS28SO27		IS28SO29		IS28SO32		IS28SO33	
Sample ID	IS28SS21-0001P		IS28SS22-0001		IS28SS24-0001		IS28SS26-0001		IS28SS27-0001		IS28SS29-0001		IS28SS32-0001		IS28SS33-0001	
Sample Date	05/19/03		05/14/03		05/14/03		05/19/03		05/16/03		05/19/03		05/19/03		05/19/03	
Chemical Name																
Ethylbenzene	18	UJ	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UJ
Methyl acetate	18	UJ	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UL
Methyl-tert-butyl ether (MTBE)	9	J	13	U	12	U	3	L	13	U	4	L	5	J	11	L
Methylcyclohexane	18	UJ	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UJ
Methylene chloride	48	B	13	U	12	U	13	B	13	U	13	B	15	B	44	B
Styrene	18	UJ	13	U	12	U	12	UL	9	J	13	UL	18	U	22	UJ
Tetrachloroethene	18	UJ	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UJ
Toluene	2	B	13	U	12	U	12	UL	13	U	13	UL	18	UL	22	UJ
Trichloroethene	18	U	13	U	12	U	12	UL	13	U	13	UL	18	UL	22	UL
Trichlorofluoromethane(Freon-11)	18	U	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UL
Vinyl chloride	18	U	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UL
Xylene, total	2	J	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UJ
cis-1,2-Dichloroethene	2	J	13	U	12	U	2	L	13	U	1	L	4	B	3	L
cis-1,3-Dichloropropene	18	U	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UL
m- and p-Xylene	2	J	NA		NA		12	UL	NA		13	UL	18	U	22	UJ
o-Xylene	18	UJ	NA		NA		12	UL	NA		13	UL	18	U	22	UJ
trans-1,2-Dichloroethene	18	U	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UL
trans-1,3-Dichloropropene	18	U	13	U	12	U	12	UL	13	U	13	UL	18	U	22	UL
Semi-volatile Organic Compounds (UG/KG)																
1,1-Biphenyl	620	U	430	U	380	U	420	U	470	U	420	U	580	U	720	U
2,4,5-Trichlorophenol	1,600	U	1,100	U	970	U	1,100	U	1,200	U	1,000	U	1,400	U	1,800	U
2,4,6-Trichlorophenol	620	U	430	U	380	U	420	U	470	U	420	U	580	U	720	U
2,4-Dichlorophenol	620	U	430	U	380	U	420	U	470	U	420	U	580	U	720	U
2,4-Dimethylphenol	620	U	430	U	380	U	420	U	470	U	420	U	580	U	720	U
2,4-Dinitrophenol	1,600	U	1,100	U	970	U	1,100	U	1,200	U	1,000	U	1,400	U	1,800	U
2,4-Dinitrotoluene	620	U	430	U	380	U	420	U	470	U	420	U	580	U	720	U
2,6-Dinitrotoluene	620	U	430	U	380	U	420	U	470	U	420	U	580	U	720	U
2-Chloronaphthalene	620	U	430	U	380	U	420	U	470	U	420	U	580	U	720	U
2-Chlorophenol	620	U	430	U	380	U	420	U	470	U	420	U	580	U	720	U
2-Methylnaphthalene	620	U	430	U	380	U	420	U	470	U	420	U	580	U	720	U
2-Methylphenol	620	U	430	U	380	U	420	U	470	U	420	U	580	U	720	U
2-Nitroaniline	1,600	U	1,100	U	970	U	1,100	U	1,200	U	1,000	U	1,400	U	1,800	U
2-Nitrophenol	620	U	430	U	380	U	420	U	470	U	420	U	580	U	720	U
3,3'-Dichlorobenzidine	620	U	430	U	380	U	420	U	470	U	420	U	580	U	720	U

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Appendix C-1
Surface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	SO21	IS28SO22	IS28SO24	IS28SO26	IS28SO27	IS28SO29	IS28SO32	IS28SO33
Sample ID	IS28SS21-0001P	IS28SS22-0001	IS28SS24-0001	IS28SS26-0001	IS28SS27-0001	IS28SS29-0001	IS28SS32-0001	IS28SS33-0001
Sample Date	05/19/03	05/14/03	05/14/03	05/19/03	05/16/03	05/19/03	05/19/03	05/19/03
Chemical Name								
3-Nitroaniline	1,600 U	1,100 U	970 U	1,100 U	1,200 U	1,000 U	1,400 U	1,800 U
4,6-Dinitro-2-methylphenol	1,600 U	1,100 U	970 U	1,100 U	1,200 U	1,000 U	1,400 U	1,800 U
4-Bromophenyl-phenylether	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
4-Chloro-3-methylphenol	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
4-Chloroaniline	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
4-Chlorophenyl-phenylether	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
4-Methylphenol	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
4-Nitroaniline	1,600 U	1,100 U	970 U	1,100 U	1,200 U	1,000 U	1,400 U	1,800 U
4-Nitrophenol	1,600 U	1,100 U	970 U	1,100 U	1,200 U	1,000 U	1,400 U	1,800 U
Acenaphthene	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Acenaphthylene	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Acetophenone	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Anthracene	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Atrazine	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Benzaldehyde	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Benzo(a)anthracene	60 J	430 U	380 U	51 J	470 U	420 U	36 J	720 U
Benzo(a)pyrene	44 J	430 U	380 U	65 J	470 U	420 U	34 J	720 U
Benzo(b)fluoranthene	620 U	26 J	380 U	98 J	24 J	420 U	73 J	720 U
Benzo(g,h,i)perylene	620 U	430 U	380 U	51 J	62 J	420 U	580 U	720 U
Benzo(k)fluoranthene	620 U	430 U	380 U	39 J	470 U	420 U	580 U	720 U
Bis(2-chloro-1-methylethyl) ether	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Butylbenzylphthalate	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Caprolactam	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Carbazole	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Chrysene	72 J	430 U	380 U	62 J	25 J	420 U	57 J	720 U
Di-n-butylphthalate	62 J	430 U	250 J	420 U	470 U	420 U	580 U	720 U
Di-n-octylphthalate	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Dibenz(a,h)anthracene	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Dibenzofuran	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Diethylphthalate	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Dimethyl phthalate	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Fluoranthene	89 J	430 U	34 J	80 J	28 J	20 J	74 J	62 J
Fluorene	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Hexachlorobenzene	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U
Hexachlorobutadiene	620 U	430 U	380 U	420 U	470 U	420 U	580 U	720 U

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Appendix C-1
Surface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	SO21		IS28SO22		IS28SO24		IS28SO26		IS28SO27		IS28SO29		IS28SO32		IS28SO33	
Sample ID	IS28SS21-0001P		IS28SS22-0001		IS28SS24-0001		IS28SS26-0001		IS28SS27-0001		IS28SS29-0001		IS28SS32-0001		IS28SS33-0001	
Sample Date	05/19/03		05/14/03		05/14/03		05/19/03		05/16/03		05/19/03		05/19/03		05/19/03	
Chemical Name																
Hexachlorocyclopentadiene	620	U	430	U	380	U	420	U	470	U	420	U	580	U	720	U
Hexachloroethane	620	U	430	U	380	U	420	U	470	U	420	U	580	U	720	U
Indeno(1,2,3-cd)pyrene	620	U	430	U	380	U	61	J	470	U	420	U	31	J	720	U
Isophorone	620	U	430	U	380	U	420	U	470	U	420	U	580	U	720	U
Naphthalene	620	U	430	U	380	U	420	U	470	U	420	U	580	U	720	U
Nitrobenzene	620	U	430	U	380	U	420	U	470	U	420	U	580	U	720	U
Pentachlorophenol	1,600	U	1,100	U	970	U	1,100	U	1,200	U	1,000	U	1,400	U	1,800	U
Phenanthrene	36	J	430	U	22	J	420	U	470	U	420	U	34	J	720	U
Phenol	620	U	430	U	380	U	420	U	470	U	420	U	580	U	720	U
Pyrene	83	J	430	U	34	J	110	J	37	J	23	J	71	J	56	J
bis(2-Chloroethoxy)methane	620	U	430	U	380	U	420	U	470	U	420	U	580	U	720	U
bis(2-Chloroethyl)ether	620	U	430	U	380	U	420	U	470	U	420	U	580	U	720	U
bis(2-Ethylhexyl)phthalate	330	J	430	U	380	U	33	B	470	U	420	U	580	U	150	J
n-Nitroso-di-n-propylamine	620	U	430	U	380	U	420	U	470	U	420	U	580	U	720	U
n-Nitrosodiphenylamine	620	U	430	U	380	U	24	J	470	U	420	U	580	U	720	U
Explosives (UG/KG)																
1,3,5-Trinitrobenzene	100	UL	100	U	100	U	100	U	100	U	100	U	100	UL	100	UL
1,3-Dinitrobenzene	100	U	100	U	100	U	100	U	100	UL	100	U	100	U	100	U
2,4,6-Trinitrotoluene	100	U	120	L	450	L	100	U	100	UL	100	U	100	U	100	U
2,4-Dinitrotoluene	100	U	100	U	230		100	U	100	U	100	U	100	U	100	U
2,6-Dinitrotoluene	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U
2-Amino-4,6-dinitrotoluene	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U
2-Nitrotoluene	200	U	200	U	200	U	200	U	200	UL	200	U	200	U	200	U
3-Nitrotoluene	200	U	200	U	200	U	200	U	200	U	200	U	200	U	200	U
4-Amino-2,6-dinitrotoluene	100	U	100	U	100	U	100	U	100	U	100	U	100	U	100	U
4-Nitrotoluene	200	U	200	U	200	U	200	U	200	U	200	U	200	U	200	U
HMX	200	U	200	U	200	U	200	U	200	UL	200	U	200	U	200	U
Nitrobenzene	100	U	100	UL	100	UL	100	U	100	UL	100	U	99	J	100	U
Nitroglycerin	9,300	U	6,500	U	6,100	U	6,100	U	7,300	U	6,100	U	8,800	U	9,200	U
Nitroguanidine	130	U	130	U	130	U	130	U	130	U	130	U	130	U	130	U
PETN	500	U	500	U	500	U	500	U	500	U	500	U	500	U	500	U
Perchlorate	40	U	40	U	40	U	42	U	41	U	40	U	41	U	40	U
RDX	200	U	200	U	200	U	200	U	200	UL	200	U	200	U	200	U
Tetryl	200	UL	140	J	620		200	U	200	U	200	U	200	UL	200	UL

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Surface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	SO21	IS28SO22	IS28SO24	IS28SO26	IS28SO27	IS28SO29	IS28SO32	IS28SO33
Sample ID	IS28SS21-0001P	IS28SS22-0001	IS28SS24-0001	IS28SS26-0001	IS28SS27-0001	IS28SS29-0001	IS28SS32-0001	IS28SS33-0001
Sample Date	05/19/03	05/14/03	05/14/03	05/19/03	05/16/03	05/19/03	05/19/03	05/19/03
Chemical Name								
Total Metals (MG/KG)								
Aluminum	4,800	13,100	4,830	1,880 J	4,900	3,790 J	6,100	2,820
Antimony	2 B	0.57 R	0.19 R	0.28 R	0.34 B	0.84 B	0.39 R	0.51 B
Arsenic	286 L	17 L	50.6 L	7.1 L	141	210 L	17 L	27.4 L
Barium	138	39.4 J	28.5 J	15.1 J	28.9 J	22.8 J	75.3	41.5 J
Beryllium	0.33 B	2 J	0.15 B	0.13 B	0.37 B	0.25 B	0.42 B	0.11 U
Cadmium	2.1 K	1.56 U	0.53 U	2.8	2.5	1.4 K	1.08 U	1.27 U
Calcium	3,860	583 J	88.4 J	156 J	442 J	185 J	1,790	983 J
Chromium	8 J	16.5	9.3	5.3 J	5.2	5 J	11.6 J	3.6 J
Cobalt	5.9 J	11.4 J	1.7 J	1.6 J	6.5 J	4 J	5.6 J	4.1 J
Copper	33.5	18.9	8.2	7.6 K	11.2 K	10.4	19.5	10.4 K
Iron	12,500	56,100	15,300	5,430	15,300	7,250	16,100	4,620
Lead	164	17.1	17.6	72.8 K	135	56.2 K	44	32
Magnesium	1,630	1,050 J	243 J	245 J	435 J	313 J	658 J	383 J
Manganese	555	79.7	23	39.2 J	392	66 J	236	53.8
Mercury	0.25	0.09 B	0.06 B	0.06 B	0.08 B	0.09 B	0.26	0.03 U
Nickel	9.3 J	19.8 K	4.4 J	2.44 U	6.3 B	3.2 J	11.2 J	5.8 J
Potassium	688 J	1,310 J	267 J	282 J	491 B	372 J	658 J	367 J
Selenium	1.1 J	1 J	0.74 K	0.45 B	0.52 U	0.56 B	0.62 U	0.73 U
Silver	1.41 U	2.3 J	1 J	1 U	1.19 U	0.92 U	1.41 U	1.66 U
Sodium	81 J	46.9 B	19.2 B	17.6 B	52.2 B	25.6 B	38.6 B	59.9 B
Thallium	0.88 U	1.27 U	0.43 U	0.62 UL	0.74 U	0.98 B	1.1 B	1.04 U
Vanadium	21.9 K	55.3	16.1	11 J	19.7 K	13.8 J	30	12.8 J
Zinc	795	316	59	1,080	585	284	64.5	44.4
Wet Chemistry (MG/KG)								
% Solids	54	77	82	81	68	83	57	54
Total organic carbon (TOC)	99,000	7,200	29,000	9,800	17,000	14,000	240,000	110,000
pH	6.4	5.9	5.5	6.5	5	6.3	5.4	4.9

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Surface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SO35		IS28SO36		IS28SO37		IS28SO38		IS28SO40		IS28SO40		IS28SO41	
Sample ID	IS28SS35-0001		IS28SS36-0001		IS28SS37-0001		IS28SS38-0001		IS28SS40-0001		IS28SS40-0001P		IS28SS41-0001	
Sample Date	05/19/03		05/19/03		05/19/03		05/19/03		05/19/03		05/19/03		05/19/03	
Chemical Name														
Volatile Organic Compounds (UG/KG)														
1,1,1-Trichloroethane	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
1,1,2,2-Tetrachloroethane	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
1,1,2-Trichloroethane	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
1,1-Dichloroethane	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
1,1-Dichloroethene	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
1,2,4-Trichlorobenzene	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
1,2-Dibromo-3-chloropropane	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
1,2-Dibromoethane	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
1,2-Dichlorobenzene	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
1,2-Dichloroethane	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
1,2-Dichloroethene (total)	4	B	3	B	3	B	2	J	5	B	3	B	2	J
1,2-Dichloropropane	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
1,3-Dichlorobenzene	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
1,4-Dichlorobenzene	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
2-Butanone	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
2-Hexanone	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
4-Methyl-2-pentanone	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
Acetone	10	B	6	B	23	B	1	B	13	B	14	B	4	B
Benzene	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
Bromodichloromethane	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
Bromoform	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
Bromomethane	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
Carbon disulfide	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
Carbon tetrachloride	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
Chlorobenzene	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
Chloroethane	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
Chloroform	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
Chloromethane	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
Cumene	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	7	J
Cyclohexane	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
Dibromochloromethane	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
Dichlorodifluoromethane(Freon-12)	17	U	11	UL	11	U	16	UJ	21	UL	20	UJ	23	U

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Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SO35		IS28SO36		IS28SO37		IS28SO38		IS28SO40		IS28SO40		IS28SO41	
Sample ID	IS28SS35-0001		IS28SS36-0001		IS28SS37-0001		IS28SS38-0001		IS28SS40-0001		IS28SS40-0001P		IS28SS41-0001	
Sample Date	05/19/03		05/19/03		05/19/03		05/19/03		05/19/03		05/19/03		05/19/03	
Chemical Name														
Ethylbenzene	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
Methyl acetate	17	U	11	UL	6	J	16	UJ	21	UL	20	UL	23	U
Methyl-tert-butyl ether (MTBE)	2	J	1	L	2	J	5	J	21	UL	20	UL	2	J
Methylcyclohexane	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
Methylene chloride	12	B	9	B	9	B	31	B	12	B	10	B	68	B
Styrene	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
Tetrachloroethene	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
Toluene	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
Trichloroethene	2	B	2	B	2	B	16	UJ	3	B	20	UL	23	U
Trichlorofluoromethane(Freon-11)	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
Vinyl chloride	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
Xylene, total	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
cis-1,2-Dichloroethene	4	B	3	B	3	B	2	J	5	B	3	B	2	J
cis-1,3-Dichloropropene	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
m- and p-Xylene	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
o-Xylene	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
trans-1,2-Dichloroethene	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
trans-1,3-Dichloropropene	17	U	11	UL	11	U	16	UJ	21	UL	20	UL	23	U
Semi-volatile Organic Compounds (UG/KG)														
1,1-Biphenyl	560	U	120	R	370	U	520	U	680	R	660	U	740	U
2,4,5-Trichlorophenol	1,400	U	130	R	930	U	1,300	U	1,700	R	1,700	U	1,800	U
2,4,6-Trichlorophenol	560	U	100	R	370	U	520	U	680	R	660	U	740	U
2,4-Dichlorophenol	560	U	100	R	370	U	520	U	680	R	660	U	740	U
2,4-Dimethylphenol	560	U	77	R	370	U	520	U	680	R	660	U	740	U
2,4-Dinitrophenol	1,400	U	940	R	930	U	1,300	U	1,700	R	1,700	U	1,800	U
2,4-Dinitrotoluene	560	U	100	R	370	U	520	U	680	R	660	U	740	U
2,6-Dinitrotoluene	560	U	110	R	370	U	520	U	680	R	660	U	740	U
2-Chloronaphthalene	560	U	110	R	370	U	520	U	680	R	660	U	740	U
2-Chlorophenol	560	U	100	R	370	U	520	U	680	R	660	U	740	U
2-Methylnaphthalene	560	U	150	R	370	U	520	U	680	R	660	U	740	U
2-Methylphenol	560	U	86	R	370	U	520	U	680	R	660	U	740	U
2-Nitroaniline	1,400	U	64	R	930	U	1,300	U	1,700	R	1,700	U	1,800	U
2-Nitrophenol	560	U	100	R	370	U	520	U	680	R	660	U	740	U
3,3'-Dichlorobenzidine	560	U	370	R	370	U	520	U	680	R	660	U	740	U

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Surface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SO35	IS28SO36	IS28SO37	IS28SO38	IS28SO40		IS28SO41
Sample ID	IS28SS35-0001	IS28SS36-0001	IS28SS37-0001	IS28SS38-0001	IS28SS40-0001	IS28SS40-0001P	IS28SS41-0001
Sample Date	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03
Chemical Name							
3-Nitroaniline	1,400 U	940 R	930 U	1,300 U	1,700 R	1,700 U	1,800 U
4,6-Dinitro-2-methylphenol	1,400 U	98 R	930 U	1,300 U	1,700 R	1,700 U	1,800 U
4-Bromophenyl-phenylether	560 U	120 R	370 U	520 U	680 R	660 U	740 U
4-Chloro-3-methylphenol	560 U	82 R	370 U	520 U	680 R	660 U	740 U
4-Chloroaniline	560 U	370 R	370 U	520 U	680 R	660 U	740 U
4-Chlorophenyl-phenylether	560 U	120 R	370 U	520 U	680 R	660 U	740 U
4-Methylphenol	560 U	80 R	370 U	520 U	680 R	660 U	740 U
4-Nitroaniline	1,400 U	940 R	930 U	1,300 U	1,700 R	1,700 U	1,800 U
4-Nitrophenol	1,400 U	940 R	930 U	1,300 U	1,700 R	1,700 U	1,800 U
Acenaphthene	560 U	130 R	370 U	520 U	680 R	660 U	740 U
Acenaphthylene	560 U	120 R	370 U	520 U	680 R	660 U	740 U
Acetophenone	560 U	100 R	370 U	520 U	680 R	660 U	740 U
Anthracene	33 J	120 R	370 U	520 U	680 R	660 U	740 U
Atrazine	560 U	100 R	370 U	520 U	680 R	660 U	740 U
Benzaldehyde	560 U	150 R	370 U	520 U	680 R	660 U	740 U
Benzo(a)anthracene	160 J	150 R	370 U	67 J	92 J	120 J	130 J
Benzo(a)pyrene	120 J	150 R	370 U	46 J	64 J	110 J	130 J
Benzo(b)fluoranthene	220 J	160 R	31 J	62 J	130 J	170 J	210 J
Benzo(g,h,i)perylene	560 U	130 R	370 U	520 U	680 R	660 U	64 J
Benzo(k)fluoranthene	86 J	150 R	370 U	37 J	47 J	65 J	91 J
Bis(2-chloro-1-methylethyl) ether	560 U	100 R	370 U	520 U	680 R	660 U	740 U
Butylbenzylphthalate	560 U	120 R	370 U	520 U	680 R	660 U	740 U
Caprolactam	560 U	86 R	370 U	520 U	680 R	660 U	740 U
Carbazole	560 U	140 R	370 U	520 U	680 R	660 U	740 U
Chrysene	160 J	170 R	370 U	76 J	120 J	150 J	180 J
Di-n-butylphthalate	31 J	120 R	370 U	520 U	680 R	54 J	740 U
Di-n-octylphthalate	560 U	120 R	370 U	520 U	680 R	660 U	740 U
Dibenz(a,h)anthracene	29 J	130 R	370 U	520 U	680 R	660 U	740 U
Dibenzofuran	560 U	120 R	370 U	520 U	680 R	660 U	740 U
Diethylphthalate	560 U	130 R	370 U	520 U	680 R	660 U	740 U
Dimethyl phthalate	560 U	110 R	370 U	520 U	680 R	660 U	740 U
Fluoranthene	240 J	200 R	44 J	120 J	180 J	220 J	190 J
Fluorene	560 U	120 R	370 U	520 U	680 R	660 U	740 U
Hexachlorobenzene	560 U	130 R	370 U	520 U	680 R	660 U	740 U
Hexachlorobutadiene	560 U	120 R	370 U	520 U	680 R	660 U	740 U

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Appendix C-1
Surface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SO35		IS28SO36		IS28SO37		IS28SO38		IS28SO40		IS28SO40		IS28SO41	
Sample ID	IS28SS35-0001		IS28SS36-0001		IS28SS37-0001		IS28SS38-0001		IS28SS40-0001		IS28SS40-0001P		IS28SS41-0001	
Sample Date	05/19/03		05/19/03		05/19/03		05/19/03		05/19/03		05/19/03		05/19/03	
Chemical Name														
Hexachlorocyclopentadiene	560	U	79	R	370	U	520	U	680	R	660	U	740	U
Hexachloroethane	560	U	95	R	370	U	520	U	680	R	660	U	740	U
Indeno(1,2,3-cd)pyrene	89	J	140	R	370	U	33	J	50	J	56	J	100	J
Isophorone	560	U	110	R	370	U	520	U	680	R	660	U	740	U
Naphthalene	560	U	110	R	370	U	520	U	680	R	660	U	740	U
Nitrobenzene	560	U	120	R	370	U	520	U	680	R	660	U	740	U
Pentachlorophenol	1,400	U	130	R	930	U	1,300	U	1,700	R	1,700	U	1,800	U
Phenanthrene	38	J	170	R	370	U	37	J	100	J	100	J	91	J
Phenol	560	U	100	R	370	U	520	U	680	R	660	U	740	U
Pyrene	210	J	160	R	22	J	99	J	180	J	190	J	230	J
bis(2-Chloroethoxy)methane	560	U	110	R	370	U	520	U	680	R	660	U	740	U
bis(2-Chloroethyl)ether	560	U	110	R	370	U	520	U	680	R	660	U	740	U
bis(2-Ethylhexyl)phthalate	120	J	160	R	370	U	520	U	89	B	110	B	140	J
n-Nitroso-di-n-propylamine	560	U	100	R	370	U	520	U	680	R	660	U	740	UL
n-Nitrosodiphenylamine	560	U	92	R	370	U	520	U	680	R	660	U	740	U
Explosives (UG/KG)														
1,3,5-Trinitrobenzene	100	UL	100	UL	100	UL	100	UL	100	UL	100	UL	100	UL
1,3-Dinitrobenzene	100	U	100	U	100	U	100	U	100	U	100	U	100	U
2,4,6-Trinitrotoluene	100	U	100	U	100	U	100	U	100	U	100	U	100	U
2,4-Dinitrotoluene	100	U	100	U	100	U	100	U	100	U	100	U	100	U
2,6-Dinitrotoluene	100	U	100	U	100	U	100	U	100	U	100	U	100	U
2-Amino-4,6-dinitrotoluene	100	U	100	U	100	U	100	U	100	U	100	U	100	U
2-Nitrotoluene	200	U	200	U	200	U	200	U	200	U	200	U	200	U
3-Nitrotoluene	200	U	200	U	200	U	200	U	200	U	200	U	200	U
4-Amino-2,6-dinitrotoluene	100	U	100	U	100	U	100	U	100	U	100	U	100	U
4-Nitrotoluene	200	U	200	U	200	U	200	U	200	U	200	U	200	U
HMX	200	U	200	U	230		200	U	200	U	200	U	200	UL
Nitrobenzene	100	U	100	U	100	U	100	U	100	U	100	U	100	U
Nitroglycerin	7,500	U	7,200	U	7,700	U	7,300	U	10,000	U	9,900	U	10,000	U
Nitroguanidine	130	U	130	U	130	U	130	U	130	U	130	U	130	U
PETN	500	U	500	U	500	U	500	U	500	U	500	U	500	U
Perchlorate	41	U	41	U	40	U	43	U	41	U	42	U	43	U
RDX	200	U	200	U	200	U	200	U	200	U	200	U	200	U
Tetryl	200	UL	200	UL	200	UL	200	UL	200	UL	200	UL	200	UL

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Appendix C-1
Surface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SO35	IS28SO36	IS28SO37	IS28SO38	IS28SO40		IS28SO41
Sample ID	IS28SS35-0001	IS28SS36-0001	IS28SS37-0001	IS28SS38-0001	IS28SS40-0001	IS28SS40-0001P	IS28SS41-0001
Sample Date	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03
Chemical Name							
Total Metals (MG/KG)							
Aluminum	3,620	1,530	3,780	6,540	5,740	5,380	6,860
Antimony	0.37 R	0.27 R	0.26 R	0.34 R	0.87 B	1.1 B	0.51 R
Arsenic	20.3 L	5.4 L	2.8 L	31.2 L	190 L	193 L	66.8 L
Barium	31.6 J	13.4 J	28.8 J	60.6	152	152	112
Beryllium	0.58 B	0.12 B	0.7 J	0.44 B	0.34 B	0.27 B	0.67 B
Cadmium	1.02 U	2.5	0.72 U	0.94 U	1.33 U	1.24 U	1.41 U
Calcium	648 J	154 J	637 J	843 J	1,960	2,430	3,920
Chromium	5.8 J	3.2 J	5.1 J	10.3 J	9.8 J	8.5 J	10.6 J
Cobalt	6.1 J	1.2 J	6 J	5.4 J	6.8 J	7.9 J	13.2 J
Copper	18.5	6.6 K	8.2 K	15.8	25.4	24.8	28.8
Iron	10,500	4,160	12,000	19,200	17,700	16,700	16,800
Lead	19.1	46.6	17	36.1	101	89.3	65.3
Magnesium	581 J	226 J	762 J	693 J	734 J	779 J	1,090 J
Manganese	106	26.7	184	114	227	324	312
Mercury	0.08 B	0.17	0.11 B	0.28	0.26	0.19 B	0.16 B
Nickel	10.4 J	2.8 J	9.6 K	12.2 K	10.4 J	13.6 J	19 K
Potassium	609 J	222 J	694 J	691 J	760 J	724 J	899 J
Selenium	0.59 U	0.43 U	0.41 U	0.54 U	0.78 J	1 J	0.81 U
Silver	1.34 U	0.97 U	0.94 U	1.23 U	1.74 U	1.62 U	1.84 U
Sodium	35.4 B	25.4 B	20.2 B	44 B	100 J	123 J	112 J
Thallium	0.83 U	0.66 B	0.72 B	0.77 U	1.08 U	1.1 B	1.4 B
Vanadium	17 K	11.9 K	21.1	21.1	17.9 J	15.7 J	23.3 K
Zinc	59.9	675	76.9	112	145	155	647
Wet Chemistry (MG/KG)							
% Solids	67	70	65	69	50	50	49
Total organic carbon (TOC)	38,000	43,000	40,000	46,000	86,000	62,000	120,000
pH	5.3	4.5	5.2	6.1	5.9	6.1	6.3

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Appendix C-2

Appendix C-2
Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM02		IS28MM03		IS28MM05		IS28MM06		IS28MM07		IS28MM11		IS28MM14		IS28MM20	
Sample ID	IS28SB02-0103		IS28SB03-0103		IS28SB05-0103		IS28SB06-0103		IS28SB07-0103		IS28SB11-0103		IS28SB14-0103		IS28SB20-0103	
Sample Date	05/12/03		05/12/03		05/12/03		05/15/03		05/16/03		05/13/03		05/15/03		05/20/03	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
1,1,1-Trichloroethane	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
1,1,2,2-Tetrachloroethane	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
1,1,2-Trichloroethane	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
1,1-Dichloroethane	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
1,1-Dichloroethene	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
1,2,4-Trichlorobenzene	1	B	0.7	B	0.7	B	12	U	12	U	15	U	11	U	12	U
1,2-Dibromo-3-chloropropane	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
1,2-Dibromoethane	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
1,2-Dichlorobenzene	0.5	B	11	U	11	U	12	U	12	U	15	U	11	U	12	U
1,2-Dichloroethane	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
1,2-Dichloroethene (total)	NA		NA		NA		NA		NA		NA		NA		2	B
1,2-Dichloropropane	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
1,3-Dichlorobenzene	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
1,4-Dichlorobenzene	0.5	B	11	U	11	U	12	U	12	U	15	U	11	U	12	U
2-Butanone	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
2-Hexanone	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
4-Methyl-2-pentanone	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
Acetone	12	U	11	U	11	U	12	U	12	U	24	B	11	U	13	J
Benzene	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
Bromodichloromethane	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
Bromoform	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
Bromomethane	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
Carbon disulfide	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
Carbon tetrachloride	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
Chlorobenzene	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
Chloroethane	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
Chloroform	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
Chloromethane	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
Cumene	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
Cyclohexane	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
Dibromochloromethane	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U
Dichlorodifluoromethane(Freon-12)	12	U	11	U	11	U	12	U	12	U	15	U	11	U	12	U

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Appendix C-2
Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM02	IS28MM03	IS28MM05	IS28MM06	IS28MM07	IS28MM11	IS28MM14	IS28MM20
Sample ID	IS28SB02-0103	IS28SB03-0103	IS28SB05-0103	IS28SB06-0103	IS28SB07-0103	IS28SB11-0103	IS28SB14-0103	IS28SB20-0103
Sample Date	05/12/03	05/12/03	05/12/03	05/15/03	05/16/03	05/13/03	05/15/03	05/20/03
Chemical Name								
Ethylbenzene	12 U	11 U	11 U	12 U	12 U	15 U	11 U	12 U
Methyl acetate	12 U	11 U	11 U	12 U	12 U	15 U	11 U	12 U
Methyl-tert-butyl ether (MTBE)	12 U	0.8 J	11 U	12 U	12 U	15 U	11 U	2 J
Methylcyclohexane	12 U	11 U	11 U	12 U	12 U	15 U	11 U	12 U
Methylene chloride	0.9 B	1 B	2 B	12 U	12 U	15 U	11 U	8 B
Styrene	12 U	11 U	11 U	12 U	12 U	15 U	11 U	12 U
Tetrachloroethene	12 U	11 U	11 U	12 U	12 U	15 U	11 U	12 U
Toluene	12 U	11 U	11 U	12 U	12 U	15 U	11 U	12 U
Trichloroethene	12 U	11 U	11 U	12 U	12 U	15 U	11 U	20
Trichlorofluoromethane(Freon-11)	12 U	11 U	11 U	12 U	12 U	15 U	11 U	12 U
Vinyl chloride	12 U	11 U	11 U	12 U	12 U	15 U	11 U	12 U
Xylene, total	12 U	11 U	11 U	12 U	12 U	15 U	11 U	12 U
cis-1,2-Dichloroethene	12 U	11 U	11 U	12 U	12 U	15 U	11 U	2 B
cis-1,3-Dichloropropene	12 U	11 U	11 U	12 U	12 U	15 U	11 U	12 U
m- and p-Xylene	NA	NA	NA	NA	NA	NA	NA	12 U
o-Xylene	NA	NA	NA	NA	NA	NA	NA	12 U
trans-1,2-Dichloroethene	12 U	11 U	11 U	12 U	12 U	15 U	11 U	12 U
trans-1,3-Dichloropropene	12 U	11 U	11 U	12 U	12 U	15 U	11 U	12 U
Semi-volatile Organic Compounds (UG/KG)								
1,1-Biphenyl	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
2,4,5-Trichlorophenol	950 U	1,000 U	960 U	980 U	1,000 U	1,100 U	970 U	980 U
2,4,6-Trichlorophenol	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
2,4-Dichlorophenol	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
2,4-Dimethylphenol	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
2,4-Dinitrophenol	950 U	1,000 U	960 U	980 U	1,000 U	1,100 U	970 U	980 U
2,4-Dinitrotoluene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
2,6-Dinitrotoluene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
2-Chloronaphthalene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
2-Chlorophenol	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
2-Methylnaphthalene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
2-Methylphenol	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
2-Nitroaniline	950 U	1,000 U	960 U	980 U	1,000 U	1,100 U	970 U	980 U
2-Nitrophenol	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
3,3'-Dichlorobenzidine	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U

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Appendix C-2
Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM02	IS28MM03	IS28MM05	IS28MM06	IS28MM07	IS28MM11	IS28MM14	IS28MM20
Sample ID	IS28SB02-0103	IS28SB03-0103	IS28SB05-0103	IS28SB06-0103	IS28SB07-0103	IS28SB11-0103	IS28SB14-0103	IS28SB20-0103
Sample Date	05/12/03	05/12/03	05/12/03	05/15/03	05/16/03	05/13/03	05/15/03	05/20/03
Chemical Name								
3-Nitroaniline	950 U	1,000 U	960 U	980 U	1,000 U	1,100 U	970 U	980 U
4,6-Dinitro-2-methylphenol	950 U	1,000 U	960 U	980 U	1,000 U	1,100 U	970 U	980 U
4-Bromophenyl-phenylether	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
4-Chloro-3-methylphenol	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
4-Chloroaniline	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
4-Chlorophenyl-phenylether	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
4-Methylphenol	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
4-Nitroaniline	950 U	1,000 U	960 U	980 U	1,000 U	1,100 U	970 U	980 U
4-Nitrophenol	950 U	1,000 U	960 U	980 U	1,000 U	1,100 U	970 U	980 U
Acenaphthene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Acenaphthylene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Acetophenone	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Anthracene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Atrazine	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Benzaldehyde	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Benzo(a)anthracene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Benzo(a)pyrene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Benzo(b)fluoranthene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Benzo(g,h,i)perylene	380 U	400 U	380 U	390 U	36 J	440 U	15 J	390 U
Benzo(k)fluoranthene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Bis(2-chloro-1-methylethyl) ether	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Butylbenzylphthalate	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Caprolactam	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Carbazole	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Chrysene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Di-n-butylphthalate	24 B	400 U	48 B	390 U	410 U	440 U	390 U	390 U
Di-n-octylphthalate	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Dibenz(a,h)anthracene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Dibenzofuran	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Diethylphthalate	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Dimethyl phthalate	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Fluoranthene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Fluorene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Hexachlorobenzene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Hexachlorobutadiene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U

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UJ
UL

Appendix C-2
Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM02	IS28MM03	IS28MM05	IS28MM06	IS28MM07	IS28MM11	IS28MM14	IS28MM20
Sample ID	IS28SB02-0103	IS28SB03-0103	IS28SB05-0103	IS28SB06-0103	IS28SB07-0103	IS28SB11-0103	IS28SB14-0103	IS28SB20-0103
Sample Date	05/12/03	05/12/03	05/12/03	05/15/03	05/16/03	05/13/03	05/15/03	05/20/03
Chemical Name								
Hexachlorocyclopentadiene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Hexachloroethane	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Indeno(1,2,3-cd)pyrene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Isophorone	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Naphthalene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Nitrobenzene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Pentachlorophenol	950 U	1,000 U	960 U	980 U	1,000 U	1,100 U	970 U	980 U
Phenanthrene	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Phenol	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Pyrene	380 U	400 U	380 U	390 U	410 U	440 U	20 J	390 U
bis(2-Chloroethoxy)methane	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
bis(2-Chloroethyl)ether	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
bis(2-Ethylhexyl)phthalate	380 U	400 U	380 U	390 U	410 U	440 U	390 U	41 B
n-Nitroso-di-n-propylamine	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 UL
n-Nitrosodiphenylamine	380 U	400 U	380 U	390 U	410 U	440 U	390 U	390 U
Explosives (UG/KG)								
1,3,5-Trinitrobenzene	100 U	100 U	100 U	100 U	100 U	240	100 U	100 U
1,3-Dinitrobenzene	100 U	100 U	100 U	100 UL	100 UL	100 U	100 UL	100 U
2,4,6-Trinitrotoluene	100 UL	100 UL	100 UL	130 L	100 UL	100 UL	100 UL	100 U
2,4-Dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2,6-Dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-Amino-4,6-dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-Nitrotoluene	200 U	200 U	200 U	200 UL	200 UL	200 U	200 UL	200 U
3-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
4-Amino-2,6-dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
4-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
HMX	200 U	200 U	200 U	200 UL	200 UL	200 U	200 UL	200 U
Nitrobenzene	100 UL	47 L	67 L	89 L	100 UL	100 U	69 L	100 U
Nitroglycerin	5,700 U	5,500 U	5,700 U	6,000 U	6,000 U	7,200 U	6,200 U	5,900 U
Nitroguanidine	130 U	130 U	130 U	130 U	130 U	130 U	130 U	130 U
PETN	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U
Perchlorate	110 U	76 U	81 U	40 U	41 U	40 U	40 U	41 U
RDX	200 U	200 U	200 U	200 UL	200 UL	200 U	200 UL	200 U
Tetryl	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U

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Appendix C-2
Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM02	IS28MM03	IS28MM05	IS28MM06	IS28MM07	IS28MM11	IS28MM14	IS28MM20
Sample ID	IS28SB02-0103	IS28SB03-0103	IS28SB05-0103	IS28SB06-0103	IS28SB07-0103	IS28SB11-0103	IS28SB14-0103	IS28SB20-0103
Sample Date	05/12/03	05/12/03	05/12/03	05/15/03	05/16/03	05/13/03	05/15/03	05/20/03
Chemical Name								
Total Metals (MG/KG)								
Aluminum	9,340	7,490	3,660	15,000	6,100	5,390	3,170	3,030 J
Antimony	0.28 R	0.28 B	0.3 B	0.29 B	0.22 U	0.3 R	0.28 U	0.28 R
Arsenic	15.4	81.7	85.2	8	22.4	19.6 L	8	3.3 L
Barium	37 J	36	25.9 J	57.2	18.3 J	33.8 J	16.7 J	21.9 J
Beryllium	0.21 B	0.24 B	0.19 B	0.48 B	0.12 B	0.57 J	0.12 B	0.07 U
Cadmium	0.76 U	1.8	4.9	0.75 U	0.65 J	0.82 U	57	0.06 U
Calcium	132 J	271 J	114 J	369 J	218 J	483 J	367 J	172 J
Chromium	10.1	9.4	4.6	20	7.3	14.5	4.5	7 J
Cobalt	3.2 J	3.4 J	2.6 J	8.8 J	0.91 B	2.5 J	2.8 J	1.1 J
Copper	4.8 J	9.5	12.9	10.4	3.5 B	19.7	50.8	2.6 B
Iron	9,670	8,200	3,400	22,400	6,400	32,500	5,010	2,960
Lead	6.1	48.4	134	15	3.9	14.1	1,090	4.6 K
Magnesium	663 J	638 J	257 J	2,120	328 J	544 J	216 J	168 J
Manganese	76.8	87.8	73.5	178	14.5	21.4	36.1	10.7 J
Mercury	0.05 B	0.03 B	0.06 B	0.04 B	0.02 U	0.05 B	0.03 B	0.04 B
Nickel	6.1 J	4.6 J	2.05 U	11.4 B	3.6 B	2.63 U	6.2 B	2.49 U
Potassium	402 J	333 J	142 J	838 B	207 B	402 J	108 U	348 J
Selenium	0.44 U	0.4 B	0.59 B	0.43 U	0.35 U	0.47 U	0.44 U	0.55 B
Silver	1.2 B	0.71 U	0.84 U	1.1 B	0.81 U	2.3	1.01 U	1.02 U
Sodium	31 B	20.4 B	20.2 B	39.1 B	22 B	67.6 B	20.6 B	42.5 B
Thallium	0.62 U	0.65 B	0.52 U	0.61 U	0.5 U	0.67 U	0.63 U	0.63 UL
Vanadium	17.8 K	17.8	8.5 J	35.3	12.1 K	70.2	9.1 J	9.6 J
Zinc	52.6	991	2,680	113	29.6	312	25,100	36.5
Wet Chemistry (MG/KG)								
% Solids	88	91	88	84	83	70	81	85

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Appendix C-2
Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM23		IS28MM28		IS28MM42		IS28SO04		IS28SO08		IS28SO09		IS28SO10		IS28SO12	
Sample ID	IS28SB23-0103		IS28SB28-0103		IS28SB42-0103		IS28SB04-0103		IS28SB08-0103		IS28SB09-0103		IS28SB10-0103		IS28SB12-0103	
Sample Date	05/15/03		05/20/03		05/14/03		05/20/03		05/13/03		05/12/03		05/13/03		05/20/03	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
1,1,1-Trichloroethane	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
1,1,2,2-Tetrachloroethane	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
1,1,2-Trichloroethane	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
1,1-Dichloroethane	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
1,1-Dichloroethene	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
1,2,4-Trichlorobenzene	15	U	12	U	12	U	11	UJ	0.5	B	0.5	B	0.5	B	14	U
1,2-Dibromo-3-chloropropane	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
1,2-Dibromoethane	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
1,2-Dichlorobenzene	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
1,2-Dichloroethane	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
1,2-Dichloroethene (total)	NA		12	U	NA		11	UJ	NA		NA		NA		14	U
1,2-Dichloropropane	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
1,3-Dichlorobenzene	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
1,4-Dichlorobenzene	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
2-Butanone	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
2-Hexanone	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
4-Methyl-2-pentanone	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
Acetone	43	B	1	B	12	U	2	B	31		11	U	11	U	7	B
Benzene	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
Bromodichloromethane	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
Bromoform	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
Bromomethane	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
Carbon disulfide	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
Carbon tetrachloride	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
Chlorobenzene	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
Chloroethane	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
Chloroform	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
Chloromethane	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
Cumene	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
Cyclohexane	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
Dibromochloromethane	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U
Dichlorodifluoromethane(Freon-12)	15	U	12	U	12	U	11	UJ	12	U	11	U	11	U	14	U

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Appendix C-2
Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM23	IS28MM28	IS28MM42	IS28SO04	IS28SO08	IS28SO09	IS28SO10	IS28SO12
Sample ID	IS28SB23-0103	IS28SB28-0103	IS28SB42-0103	IS28SB04-0103	IS28SB08-0103	IS28SB09-0103	IS28SB10-0103	IS28SB12-0103
Sample Date	05/15/03	05/20/03	05/14/03	05/20/03	05/13/03	05/12/03	05/13/03	05/20/03
Chemical Name								
Ethylbenzene	15 U	12 U	12 U	11 UJ	12 U	11 U	11 U	14 U
Methyl acetate	15 U	12 U	12 U	11 UJ	12 U	11 U	11 U	14 U
Methyl-tert-butyl ether (MTBE)	15 U	2 J	12 U	11 UJ	1 J	11 U	11 U	5 J
Methylcyclohexane	15 U	12 U	12 U	11 UJ	12 U	11 U	11 U	14 U
Methylene chloride	1 B	11 B	12 U	7 B	1 J	11 U	1 B	15 B
Styrene	15 U	12 U	12 U	11 UJ	12 U	11 U	11 U	14 U
Tetrachloroethene	15 U	12 U	12 U	11 UJ	12 U	11 U	11 U	14 U
Toluene	15 U	12 U	12 U	11 UJ	12 U	11 U	11 U	14 U
Trichloroethene	15 U	12 U	12 U	11 UJ	12 U	11 U	11 U	14 U
Trichlorofluoromethane(Freon-11)	15 U	12 U	12 U	11 UJ	12 U	11 U	11 U	14 U
Vinyl chloride	15 U	12 U	12 U	11 UJ	12 U	11 U	11 U	14 U
Xylene, total	15 U	12 U	12 U	11 UJ	12 U	11 U	11 U	14 U
cis-1,2-Dichloroethene	15 U	12 U	12 U	11 UJ	12 U	11 U	11 U	14 U
cis-1,3-Dichloropropene	15 U	12 U	12 U	11 UJ	12 U	11 U	11 U	14 U
m- and p-Xylene	NA	12 U	NA	11 UJ	NA	NA	NA	14 U
o-Xylene	NA	12 U	NA	11 UJ	NA	NA	NA	14 U
trans-1,2-Dichloroethene	15 U	12 U	12 U	11 UJ	12 U	11 U	11 U	14 U
trans-1,3-Dichloropropene	15 U	12 U	12 U	11 UJ	12 U	11 U	11 U	14 U
Semi-volatile Organic Compounds (UG/KG)								
1,1-Biphenyl	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
2,4,5-Trichlorophenol	1,200 U	1,000 U	990 U	940 U	980 U	880 U	930 U	1,100 U
2,4,6-Trichlorophenol	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
2,4-Dichlorophenol	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
2,4-Dimethylphenol	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
2,4-Dinitrophenol	1,200 U	1,000 U	990 U	940 U	980 U	880 U	930 U	1,100 U
2,4-Dinitrotoluene	460 U	420 U	400 U	370 U	390 U	350 U	400	450 U
2,6-Dinitrotoluene	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
2-Chloronaphthalene	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
2-Chlorophenol	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
2-Methylnaphthalene	460 U	420 U	32 J	370 U	390 U	350 U	370 U	450 U
2-Methylphenol	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
2-Nitroaniline	1,200 U	1,000 U	990 U	940 U	980 U	880 U	930 U	1,100 U
2-Nitrophenol	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
3,3'-Dichlorobenzidine	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U

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Appendix C-2
Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM23	IS28MM28	IS28MM42	IS28SO04	IS28SO08	IS28SO09	IS28SO10	IS28SO12
Sample ID	IS28SB23-0103	IS28SB28-0103	IS28SB42-0103	IS28SB04-0103	IS28SB08-0103	IS28SB09-0103	IS28SB10-0103	IS28SB12-0103
Sample Date	05/15/03	05/20/03	05/14/03	05/20/03	05/13/03	05/12/03	05/13/03	05/20/03
Chemical Name								
3-Nitroaniline	1,200 U	1,000 U	990 U	940 U	980 U	880 U	930 U	1,100 U
4,6-Dinitro-2-methylphenol	1,200 U	1,000 U	990 U	940 U	980 U	880 U	930 U	1,100 U
4-Bromophenyl-phenylether	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
4-Chloro-3-methylphenol	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
4-Chloroaniline	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
4-Chlorophenyl-phenylether	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
4-Methylphenol	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
4-Nitroaniline	1,200 U	1,000 U	990 U	940 U	980 U	880 U	930 U	1,100 U
4-Nitrophenol	1,200 U	1,000 U	990 U	940 U	980 U	880 U	930 U	1,100 U
Acenaphthene	36 J	420 U	27 J	370 U	390 U	350 U	370 U	450 U
Acenaphthylene	32 J	420 U	78 J	370 U	390 U	350 U	370 U	450 U
Acetophenone	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
Anthracene	97 J	420 U	100 J	370 U	390 U	350 U	26 J	450 U
Atrazine	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
Benzaldehyde	32 J	420 U	400 U	370 U	390 U	350 U	370 U	450 U
Benzo(a)anthracene	340 J	420 U	410	370 U	390 U	350 U	110 J	450 U
Benzo(a)pyrene	330 J	420 U	430	370 U	390 U	350 U	130 J	450 U
Benzo(b)fluoranthene	480	420 U	540	370 U	390 U	350 U	250 J	450 U
Benzo(g,h,i)perylene	99 J	420 U	370 J	370 U	390 U	350 U	370 U	450 U
Benzo(k)fluoranthene	190 J	420 U	210 J	370 U	390 U	350 U	100 J	450 U
Bis(2-chloro-1-methylethyl) ether	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
Butylbenzylphthalate	460 U	420 U	76 J	370 U	390 U	350 U	370 U	450 U
Caprolactam	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
Carbazole	78 J	420 U	27 J	370 U	390 U	350 U	370 U	450 U
Chrysene	440 J	420 U	470	370 U	390 U	350 U	140 J	450 U
Di-n-butylphthalate	85 B	30 J	95 B	19 J	390 U	42 B	380	24 J
Di-n-octylphthalate	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
Dibenz(a,h)anthracene	68 J	420 U	97 J	370 U	390 U	350 U	370 U	450 U
Dibenzofuran	38 J	420 U	22 J	370 U	390 U	350 U	370 U	450 U
Diethylphthalate	34 J	420 U	400 U	370 U	390 U	350 U	75 J	450 U
Dimethyl phthalate	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
Fluoranthene	770	420 U	670	370 U	390 U	350 U	170 J	450 U
Fluorene	58 J	420 U	68 J	370 U	390 U	350 U	370 U	450 U
Hexachlorobenzene	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
Hexachlorobutadiene	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U

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Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM23	IS28MM28	IS28MM42	IS28SO04	IS28SO08	IS28SO09	IS28SO10	IS28SO12
Sample ID	IS28SB23-0103	IS28SB28-0103	IS28SB42-0103	IS28SB04-0103	IS28SB08-0103	IS28SB09-0103	IS28SB10-0103	IS28SB12-0103
Sample Date	05/15/03	05/20/03	05/14/03	05/20/03	05/13/03	05/12/03	05/13/03	05/20/03
Chemical Name								
Hexachlorocyclopentadiene	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
Hexachloroethane	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
Indeno(1,2,3-cd)pyrene	250 J	420 U	400	370 U	390 U	350 U	130 J	450 U
Isophorone	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
Naphthalene	35 J	420 U	25 J	370 U	390 U	350 U	370 U	450 U
Nitrobenzene	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
Pentachlorophenol	1,200 U	1,000 U	990 U	940 U	980 U	880 U	930 U	1,100 U
Phenanthrene	510	420 U	560	370 U	390 U	350 U	92 J	450 U
Phenol	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
Pyrene	650	420 U	740	370 U	390 U	350 U	150 J	450 U
bis(2-Chloroethoxy)methane	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
bis(2-Chloroethyl)ether	460 U	420 U	400 U	370 U	390 U	350 U	370 U	450 U
bis(2-Ethylhexyl)phthalate	460 U	68 B	58 J	36 B	390 U	350 U	110 B	120 B
n-Nitroso-di-n-propylamine	460 U	420 UL	400 U	370 UL	390 U	350 U	370 U	450 UL
n-Nitrosodiphenylamine	26 J	420 U	72 J	370 U	390 U	350 U	110 J	450 U
Explosives (UG/KG)								
1,3,5-Trinitrobenzene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
1,3-Dinitrobenzene	100 UL	100 U	100 U	100 U	63 J	100 U	100 U	100 U
2,4,6-Trinitrotoluene	100 UL	100 U	76 L	100 U	100 UL	100 UL	100 UL	41 J
2,4-Dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2,6-Dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-Amino-4,6-dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-Nitrotoluene	200 UL	200 U	200 U	200 U	200 U	200 U	200 U	200 U
3-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
4-Amino-2,6-dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
4-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
HMX	200 UL	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Nitrobenzene	100 UL	100 U	100 UL	100 U	100 U	79 L	100 U	80 J
Nitroglycerin	7,000 U	6,300 U	5,900 U	5,900 U	6,000 U	5,500 U	5,500 U	6,900 U
Nitroguanidine	130 U	130 U	130 U	130 U	130 U	130 U	130 U	130 U
PETN	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U
Perchlorate	40 U	40 U	40 U	40 U	60 U	160 U	150 U	41 U
RDX	200 UL	200 U	200 U	200 U	200 U	200 U	200 U	200 U
Tetryl	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U

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Appendix C-2
Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM23	IS28MM28	IS28MM42	IS28SO04	IS28SO08	IS28SO09	IS28SO10	IS28SO12
Sample ID	IS28SB23-0103	IS28SB28-0103	IS28SB42-0103	IS28SB04-0103	IS28SB08-0103	IS28SB09-0103	IS28SB10-0103	IS28SB12-0103
Sample Date	05/15/03	05/20/03	05/14/03	05/20/03	05/13/03	05/12/03	05/13/03	05/20/03
Chemical Name								
Total Metals (MG/KG)								
Aluminum	3,570	7,860 J	6,560	6,980 J	3,310	3,960	3,920	10,400 J
Antimony	0.25 U	0.3 B	0.27 R	0.24 R	0.21 R	0.19 R	0.2 R	0.33 R
Arsenic	324	3.2 L	23.3 L	9.1 L	1 J	1.7 B	13.7 L	1 J
Barium	45.3	27.1 J	59.9	19.6 J	17.3 J	12.8 J	127	51.6
Beryllium	0.65 B	0.26 B	0.16 B	0.06 U	0.06 B	0.09 B	0.19 B	1.4 K
Cadmium	10	0.06 U	13.6	0.05 U	0.59 U	0.52 U	66.1	0.07 U
Calcium	549 J	70.1 J	1,730	168 J	369 J	48.7 J	1,350	913 J
Chromium	9.9	8 J	22.8	8.2 J	5.3	5	23.9	18.6 J
Cobalt	7.1 J	3.1 J	7.9 J	0.99 J	0.86 B	0.76 J	3.1 J	2.4 J
Copper	26.6	8.1 K	51.7	3 J	2.3 J	2.5 B	125	56.6
Iron	36,200	7,940	15,300	1,600	5,710	4,410	16,200	53,000
Lead	1,020	7.4 K	410	5.5 K	6 J	3.7	1,640 J	9.8 K
Magnesium	262 J	374 J	2,880	288 J	247 J	247 J	467 J	1,150 J
Manganese	303	10.6 J	110	6.4 J	5.6 J	15.7	157 J	12.1 J
Mercury	0.07 B	0.07 B	0.24 B	0.05 B	0.02 B	0.05 B	0.1 B	0.06 B
Nickel	8.4 B	5.2 J	91.9	3.6 J	1.89 U	1.67 U	9.8 K	5.6 J
Potassium	201 B	443 J	272 J	392 J	317 J	235 J	275 J	255 J
Selenium	0.6 B	0.56 B	0.42 U	0.38 U	0.35 J	0.3 U	0.32 U	0.52 U
Silver	0.88 U	0.94 U	1.6 J	0.87 U	1.2 J	1.2 B	0.83 J	1.19 U
Sodium	52.4 B	33.8 B	64.1 B	34.3 B	41.8 B	60.3 B	32.2 B	164 J
Thallium	0.55 U	0.59 UL	0.6 U	0.54 UL	0.48 U	0.42 U	0.45 U	0.74 UL
Vanadium	13.7 K	24.9 J	21.8	10.9 J	13.9 K	10.3 K	12 K	92.5 J
Zinc	4,170	48	6,090	21	36.3 L	12.2	33,900 L	61.4
Wet Chemistry (MG/KG)								
% Solids	71	79	85	85	84	91	91	72

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Appendix C-2
Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SO13		IS28SO15	IS28SO17	IS28SO18	IS28SO19	IS28SO21	
Sample ID	IS28SB13-0105	IS28SB13-0105P	IS28SB15-0103	IS28SB17-0103	IS28SB18-0103	IS28SB19-0105	IS28SB21-0103P	IS28SB21-0103
Sample Date	05/13/03	05/13/03	05/13/03	05/12/03	05/13/03	05/13/03	05/19/03	05/19/03
Chemical Name								
Volatile Organic Compounds (UG/KG)								
1,1,1-Trichloroethane	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
1,1,2,2-Tetrachloroethane	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
1,1,2-Trichloroethane	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
1,1-Dichloroethane	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
1,1-Dichloroethene	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
1,2,4-Trichlorobenzene	12 U	12 U	0.5 B	0.5 B	14 U	0.7 B	10 U	10 U
1,2-Dibromo-3-chloropropane	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
1,2-Dibromoethane	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
1,2-Dichlorobenzene	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
1,2-Dichloroethane	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	1 B	10 U
1,2-Dichloropropane	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
1,3-Dichlorobenzene	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
1,4-Dichlorobenzene	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
2-Butanone	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
2-Hexanone	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
4-Methyl-2-pentanone	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
Acetone	12 U	12 U	11 U	11 U	46 B	18 U	10 B	7 B
Benzene	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
Bromodichloromethane	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
Bromoform	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
Bromomethane	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
Carbon disulfide	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
Carbon tetrachloride	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
Chlorobenzene	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
Chloroethane	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
Chloroform	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
Chloromethane	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 UJ
Cumene	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
Cyclohexane	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
Dibromochloromethane	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
Dichlorodifluoromethane(Freon-12)	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 UJ

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Appendix C-2
Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SO13		IS28SO15	IS28SO17	IS28SO18	IS28SO19	IS28SO21	
Sample ID	IS28SB13-0105	IS28SB13-0105P	IS28SB15-0103	IS28SB17-0103	IS28SB18-0103	IS28SB19-0105	IS28SB21-0103P	IS28SB21-0103
Sample Date	05/13/03	05/13/03	05/13/03	05/12/03	05/13/03	05/13/03	05/19/03	05/19/03
Chemical Name								
Ethylbenzene	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
Methyl acetate	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
Methyl-tert-butyl ether (MTBE)	0.9 J	0.6 J	11 U	0.6 J	14 U	18 U	2 J	2 J
Methylcyclohexane	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
Methylene chloride	12 U	12 U	0.9 B	11 U	2 B	3 B	7 B	9 B
Styrene	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
Tetrachloroethene	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
Toluene	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
Trichloroethene	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
Trichlorofluoromethane(Freon-11)	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
Vinyl chloride	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
Xylene, total	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
cis-1,2-Dichloroethene	12 U	12 U	11 U	11 U	14 U	18 U	1 B	10 U
cis-1,3-Dichloropropene	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
m- and p-Xylene	NA	NA	NA	NA	NA	NA	10 U	10 U
o-Xylene	NA	NA	NA	NA	NA	NA	10 U	10 U
trans-1,2-Dichloroethene	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
trans-1,3-Dichloropropene	12 U	12 U	11 U	11 U	14 U	18 U	10 U	10 U
Semi-volatile Organic Compounds (UG/KG)								
1,1-Biphenyl	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
2,4,5-Trichlorophenol	1,100 U	1,100 U	950 U	930 U	1,000 U	1,600 U	990 U	960 U
2,4,6-Trichlorophenol	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
2,4-Dichlorophenol	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
2,4-Dimethylphenol	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
2,4-Dinitrophenol	1,100 U	1,100 U	950 U	930 U	1,000 U	1,600 U	990 U	960 U
2,4-Dinitrotoluene	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
2,6-Dinitrotoluene	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
2-Chloronaphthalene	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
2-Chlorophenol	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
2-Methylnaphthalene	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
2-Methylphenol	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
2-Nitroaniline	1,100 U	1,100 U	950 U	930 U	1,000 U	1,600 U	990 U	960 U
2-Nitrophenol	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
3,3'-Dichlorobenzidine	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U

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Appendix C-2
Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SO13		IS28SO15	IS28SO17	IS28SO18	IS28SO19	IS28SO21	
Sample ID	IS28SB13-0105	IS28SB13-0105P	IS28SB15-0103	IS28SB17-0103	IS28SB18-0103	IS28SB19-0105	IS28SB21-0103P	IS28SB21-0103
Sample Date	05/13/03	05/13/03	05/13/03	05/12/03	05/13/03	05/13/03	05/19/03	05/19/03
Chemical Name								
3-Nitroaniline	1,100 U	1,100 U	950 U	930 U	1,000 U	1,600 U	990 U	960 U
4,6-Dinitro-2-methylphenol	1,100 U	1,100 U	950 U	930 U	1,000 U	1,600 U	990 U	960 U
4-Bromophenyl-phenylether	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
4-Chloro-3-methylphenol	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
4-Chloroaniline	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
4-Chlorophenyl-phenylether	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
4-Methylphenol	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
4-Nitroaniline	1,100 U	1,100 U	950 U	930 U	1,000 U	1,600 U	990 U	960 U
4-Nitrophenol	1,100 U	1,100 U	950 U	930 U	1,000 U	1,600 U	990 U	960 U
Acenaphthene	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
Acenaphthylene	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
Acetophenone	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
Anthracene	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
Atrazine	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
Benzaldehyde	460 U	450 U	380 U	370 U	410 U	60 J	390 U	380 U
Benzo(a)anthracene	460 U	450 U	380 U	39 J	52 J	640 U	390 U	380 U
Benzo(a)pyrene	460 U	450 U	30 J	36 J	47 J	640 U	390 U	380 U
Benzo(b)fluoranthene	460 U	450 U	380 U	61 J	120 J	640 U	390 U	380 U
Benzo(g,h,i)perylene	460 U	450 U	44 J	39 J	36 J	640 U	390 U	380 U
Benzo(k)fluoranthene	460 U	450 U	380 U	370 U	56 J	640 U	390 U	380 U
Bis(2-chloro-1-methylethyl) ether	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
Butylbenzylphthalate	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
Caprolactam	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
Carbazole	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
Chrysene	460 U	450 U	380 U	46 J	74 J	640 U	390 U	380 U
Di-n-butylphthalate	460 U	450 U	380 U	63 B	22 B	74 B	390 U	35 J
Di-n-octylphthalate	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
Dibenz(a,h)anthracene	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
Dibenzofuran	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
Diethylphthalate	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
Dimethyl phthalate	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
Fluoranthene	460 U	450 U	380 U	69 J	83 J	47 J	390 U	380 U
Fluorene	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
Hexachlorobenzene	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
Hexachlorobutadiene	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U

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Appendix C-2
Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SO13		IS28SO15	IS28SO17	IS28SO18	IS28SO19	IS28SO21	
Sample ID	IS28SB13-0105	IS28SB13-0105P	IS28SB15-0103	IS28SB17-0103	IS28SB18-0103	IS28SB19-0105	IS28SB21-0103P	IS28SB21-0103
Sample Date	05/13/03	05/13/03	05/13/03	05/12/03	05/13/03	05/13/03	05/19/03	05/19/03
Chemical Name								
Hexachlorocyclopentadiene	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
Hexachloroethane	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
Indeno(1,2,3-cd)pyrene	460 U	450 U	380 U	36 J	49 J	640 U	390 U	380 U
Isophorone	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
Naphthalene	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
Nitrobenzene	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
Pentachlorophenol	1,100 U	1,100 U	950 U	930 U	1,000 U	1,600 U	990 U	960 U
Phenanthrene	460 U	450 U	380 U	21 J	25 J	39 J	390 U	380 U
Phenol	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
Pyrene	460 U	450 U	380 U	67 J	84 J	37 J	390 U	380 U
bis(2-Chloroethoxy)methane	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
bis(2-Chloroethyl)ether	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
bis(2-Ethylhexyl)phthalate	460 U	450 U	64 B	370 U	69 J	640 U	54 B	52 B
n-Nitroso-di-n-propylamine	460 U	450 U	380 U	370 U	410 U	640 U	390 U	380 U
n-Nitrosodiphenylamine	460 U	450 U	380 U	370 U	130 J	2,000	390 U	380 U
Explosives (UG/KG)								
1,3,5-Trinitrobenzene	100 U	100 U	390	100 U	100 U	100 UL	100 U	100 U
1,3-Dinitrobenzene	100 U	100 U	100 U	100 U	100 U	100 UL	100 U	100 U
2,4,6-Trinitrotoluene	100 UL	280 L	100 UL	100 UL	100 UL	100 UL	59 J	100 U
2,4-Dinitrotoluene	100 U	67 J	100 U	100 U	100 U	100 UL	100 U	100 U
2,6-Dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 UL	100 U	100 U
2-Amino-4,6-dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 UL	100 U	100 U
2-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 UL	200 U	200 U
3-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 UL	200 U	200 U
4-Amino-2,6-dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 UL	100 U	100 U
4-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 UL	200 U	200 U
HMX	200 U	200 U	200 U	200 U	200 U	200 UL	200 U	200 U
Nitrobenzene	190	100 U	150	100 UL	100 U	260 L	100 U	100 U
Nitroglycerin	6,000 U	6,900 U	5,600 U	6,100 U	6,500 U	6,200 U	6,400 U	6,100 U
Nitroguanidine	130 U	130 U	130 U	130 U	130 U	130 U	130 U	130 U
PETN	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U
Perchlorate	40 U	40 U	40 U	85 U	40 U	750 U	40 U	40 U
RDX	200 U	200 U	200 U	200 U	200 U	200 UL	200 U	200 U
Tetryl	200 U	130 J	200 U	200 U	200 U	200 UL	200 U	200 U

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Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SO13		IS28SO15	IS28SO17	IS28SO18	IS28SO19	IS28SO21	
Sample ID	IS28SB13-0105	IS28SB13-0105P	IS28SB15-0103	IS28SB17-0103	IS28SB18-0103	IS28SB19-0105	IS28SB21-0103P	IS28SB21-0103
Sample Date	05/13/03	05/13/03	05/13/03	05/12/03	05/13/03	05/13/03	05/19/03	05/19/03
Chemical Name								
Total Metals (MG/KG)								
Aluminum	4,890	5,410	2,100	3,420	1,040	8,920	6,460 J	2,080 J
Antimony	0.22 R	0.24 R	0.21 R	0.24 R	0.19 R	101 L	0.27 R	0.22 R
Arsenic	0.91 J	0.76 J	0.28 UL	7.8	8.9 L	37.2 L	5 L	16.6 L
Barium	13.4 J	14.7 J	22 J	25.9 J	29.8	3,670	26.1 J	27.3 J
Beryllium	0.1 B	0.08 B	0.07 B	0.14 B	0.09 B	0.29 B	0.19 B	0.05 U
Cadmium	1.2 B	0.68 B	0.58 U	14.6	4.8	125	0.74 U	0.61 U
Calcium	280 J	246 J	268 J	567 J	92.2 J	22,400	379 J	220 J
Chromium	3.5	4.4	2.6 K	10.7	2.1 B	176	11.2 J	3.3 J
Cobalt	1.5 B	2.1 J	0.79 B	1.6 J	0.55 B	19.2 J	1 J	0.74 B
Copper	3.3 J	3 J	9.4	16.1	18.2	2,300	6.8 K	2.5 B
Iron	4,670	4,850	1,330	8,360	2,150	130,000	16,200	1,600
Lead	3.4	5.3	28.2 J	152	149	16,600 J	8.6 K	6.7 K
Magnesium	320 J	331 J	172 J	295 J	95.1 J	23,300	450 J	197 J
Manganese	10.6	12.4	36.7 J	52.5	13.5	1,060 J	8.4 J	8.2 J
Mercury	0.13 B	0.11 B	0.04 B	0.13 K	0.12 B	0.36	0.05 B	0.06 B
Nickel	2.2 J	3.4 J	1.84 U	5.7 J	2.3 J	251	2.35 U	1.94 U
Potassium	272 J	266 J	122 J	230 J	86.7 J	6,140	652 J	250 J
Selenium	0.35 U	0.38 U	0.33 U	0.66 B	0.31 U	1.18 U	0.42 B	0.35 U
Silver	0.79 U	0.86 U	0.75 U	1.1 B	0.7 U	6.7 K	0.96 U	0.79 U
Sodium	29.3 B	19.4 B	22.6 B	20 B	21.9 B	326 B	55.2 B	21.1 B
Thallium	0.49 U	0.63 B	0.53 B	0.55 U	0.44 U	1.68 U	0.73 B	0.49 UL
Vanadium	16 K	16.8 K	5.2 J	10.7 K	3 J	28.8 K	29.1 J	3.8 J
Zinc	108	128	96.9 L	4,660	2,740	51,100 L	23.9	104
Wet Chemistry (MG/KG)								
% Solids	83	72	89	82	77	80	78	82

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UL

Appendix C-2
Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SO22		IS28SO24		IS28SO26		IS28SO27		IS28SO29		IS28SO32		IS28SO33			
Sample ID	IS28SB22-0103		IS28SB24-0103		IS28SB26-0103		IS28SB27-0103		IS28SB29-0103		IS28SB32-0103		IS28SB33-0103		IS28SB33-0103P	
Sample Date	05/14/03		05/14/03		05/19/03		05/16/03		05/19/03		05/19/03		05/19/03		05/19/03	
Chemical Name																
Volatile Organic Compounds (UG/KG)																
1,1,1-Trichloroethane	13	U	12	U	10	U	13	U	12	U	13	UJ	12	U	13	U
1,1,2,2-Tetrachloroethane	13	U	12	U	10	U	13	U	12	U	13	UJ	12	U	13	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	13	U	12	U	10	U	13	U	12	U	13	UJ	12	U	13	U
1,1,2-Trichloroethane	13	U	12	U	10	U	13	U	12	U	13	UJ	12	U	13	U
1,1-Dichloroethane	13	U	12	U	10	U	13	U	12	U	13	UJ	12	U	13	U
1,1-Dichloroethene	13	U	12	U	10	U	13	U	12	UL	13	UJ	12	U	13	U
1,2,4-Trichlorobenzene	13	U	12	U	10	U	13	U	12	U	13	UJ	12	U	13	U
1,2-Dibromo-3-chloropropane	13	U	12	U	10	U	13	U	12	U	13	UJ	12	U	13	U
1,2-Dibromoethane	13	U	12	U	10	U	13	U	12	U	13	UJ	12	U	13	U
1,2-Dichlorobenzene	13	U	12	U	10	U	13	U	12	U	13	UJ	12	U	13	U
1,2-Dichloroethane	13	U	12	U	10	U	13	U	12	U	13	UJ	12	U	13	U
1,2-Dichloroethene (total)	NA		NA		1	B	NA		1	B	2	J	2	B	2	B
1,2-Dichloropropane	13	U	12	U	10	U	13	U	12	U	13	UJ	12	U	13	U
1,3-Dichlorobenzene	13	U	12	U	10	U	13	U	12	U	13	UJ	12	U	13	U
1,4-Dichlorobenzene	13	U	12	U	10	U	13	U	12	U	13	UJ	12	U	13	U
2-Butanone	13	U	12	U	4	J	13	U	12	U	13	UJ	12	U	13	U
2-Hexanone	13	U	12	U	10	U	13	U	12	U	13	UJ	12	U	13	U
4-Methyl-2-pentanone	13	U	12	U	10	U	13	U	12	U	13	UJ	12	U	13	U
Acetone	13	U	12	U	16	B	13	U	9	B	34	B	8	B	8	B
Benzene	13	U	12	U	10	UL	13	U	12	U	13	UJ	12	U	13	U
Bromodichloromethane	13	U	12	U	10	U	13	U	12	U	13	UJ	12	U	13	U
Bromoform	13	U	12	U	10	U	13	U	12	U	13	UJ	12	U	13	U
Bromomethane	13	U	12	U	10	U	13	U	12	U	13	UJ	12	U	13	U
Carbon disulfide	13	U	12	U	10	U	13	U	12	U	13	UJ	12	U	13	U
Carbon tetrachloride	13	U	12	U	10	U	13	U	12	U	13	UJ	12	U	13	U
Chlorobenzene	13	U	12	U	10	U	13	U	12	UL	13	UJ	12	U	13	U
Chloroethane	13	U	12	U	10	U	13	U	12	U	13	UJ	12	U	13	U
Chloroform	13	U	12	U	10	U	13	U	12	U	13	UJ	12	U	13	U
Chloromethane	13	U	12	U	10	UJ	13	U	12	UJ	13	UJ	12	U	13	U
Cumene	13	U	12	U	10	U	13	U	12	U	13	UJ	12	U	13	U
Cyclohexane	13	U	12	U	10	U	13	U	12	UL	13	UJ	12	U	13	U
Dibromochloromethane	13	U	12	U	10	U	13	U	12	U	13	UJ	12	U	13	U
Dichlorodifluoromethane(Freon-12)	13	U	12	U	10	UJ	13	U	12	UJ	13	UJ	12	UJ	13	UJ

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Appendix C-2
Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SO22	IS28SO24	IS28SO26	IS28SO27	IS28SO29	IS28SO32	IS28SO33	
Sample ID	IS28SB22-0103	IS28SB24-0103	IS28SB26-0103	IS28SB27-0103	IS28SB29-0103	IS28SB32-0103	IS28SB33-0103	IS28SB33-0103P
Sample Date	05/14/03	05/14/03	05/19/03	05/16/03	05/19/03	05/19/03	05/19/03	05/19/03
Chemical Name								
Ethylbenzene	13 U	12 U	10 U	13 U	12 U	2 J	12 U	13 U
Methyl acetate	13 U	12 U	10 U	13 U	12 U	6 J	12 U	13 U
Methyl-tert-butyl ether (MTBE)	0.7 J	12 U	2 J	13 U	12 U	4 J	2 J	4 J
Methylcyclohexane	13 U	12 U	10 U	13 U	12 U	13 UJ	12 U	13 U
Methylene chloride	13 U	12 U	10 B	13 U	10 B	33 B	9 B	10 B
Styrene	13 U	12 U	10 U	13 U	12 U	13 UJ	12 U	13 U
Tetrachloroethene	13 U	12 U	10 U	13 U	12 U	13 UJ	12 U	13 U
Toluene	13 U	12 U	10 U	13 U	12 UL	3 B	12 U	13 U
Trichloroethene	13 U	12 U	10 U	13 U	12 UL	13 UJ	12 U	13 U
Trichlorofluoromethane(Freon-11)	13 U	12 U	10 U	13 U	12 U	13 UJ	12 U	13 U
Vinyl chloride	13 U	12 U	10 U	13 U	12 U	13 UJ	12 U	13 U
Xylene, total	13 U	12 U	10 U	13 U	12 U	13 UJ	12 U	13 U
cis-1,2-Dichloroethene	13 U	12 U	1 B	13 U	1 B	2 J	2 B	2 B
cis-1,3-Dichloropropene	13 U	12 U	10 U	13 U	12 U	13 UJ	12 U	13 U
m- and p-Xylene	NA	NA	10 U	NA	12 U	13 UJ	12 U	13 U
o-Xylene	NA	NA	10 U	NA	12 U	13 UJ	12 U	13 U
trans-1,2-Dichloroethene	13 U	12 U	10 U	13 U	12 U	13 UJ	12 U	13 U
trans-1,3-Dichloropropene	13 U	12 U	10 U	13 U	12 U	13 UJ	12 U	13 U
Semi-volatile Organic Compounds (UG/KG)								
1,1-Biphenyl	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
2,4,5-Trichlorophenol	1,100 U	980 U	1,000 U	1,000 U	1,000 U	1,100 U	1,000 U	1,000 U
2,4,6-Trichlorophenol	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
2,4-Dichlorophenol	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
2,4-Dimethylphenol	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
2,4-Dinitrophenol	1,100 U	980 U	1,000 U	1,000 U	1,000 U	1,100 U	1,000 U	1,000 U
2,4-Dinitrotoluene	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
2,6-Dinitrotoluene	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
2-Chloronaphthalene	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
2-Chlorophenol	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
2-Methylnaphthalene	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
2-Methylphenol	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
2-Nitroaniline	1,100 U	980 U	1,000 U	1,000 U	1,000 U	1,100 U	1,000 U	1,000 U
2-Nitrophenol	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
3,3'-Dichlorobenzidine	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U

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Appendix C-2
Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SO22	IS28SO24	IS28SO26	IS28SO27	IS28SO29	IS28SO32	IS28SO33	
Sample ID	IS28SB22-0103	IS28SB24-0103	IS28SB26-0103	IS28SB27-0103	IS28SB29-0103	IS28SB32-0103	IS28SB33-0103	IS28SB33-0103P
Sample Date	05/14/03	05/14/03	05/19/03	05/16/03	05/19/03	05/19/03	05/19/03	05/19/03
Chemical Name								
3-Nitroaniline	1,100 U	980 U	1,000 U	1,000 U	1,000 U	1,100 U	1,000 U	1,000 U
4,6-Dinitro-2-methylphenol	1,100 U	980 U	1,000 U	1,000 U	1,000 U	1,100 U	1,000 U	1,000 U
4-Bromophenyl-phenylether	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
4-Chloro-3-methylphenol	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
4-Chloroaniline	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
4-Chlorophenyl-phenylether	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
4-Methylphenol	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
4-Nitroaniline	1,100 U	980 U	1,000 U	1,000 U	1,000 U	1,100 U	1,000 U	1,000 U
4-Nitrophenol	1,100 U	980 U	1,000 U	1,000 U	1,000 U	1,100 U	1,000 U	1,000 U
Acenaphthene	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Acenaphthylene	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Acetophenone	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Anthracene	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Atrazine	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Benzaldehyde	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Benzo(a)anthracene	430 U	390 U	410 U	400 U	410 U	22 J	400 U	400 U
Benzo(a)pyrene	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Benzo(b)fluoranthene	430 U	390 U	410 U	400 U	410 U	23 J	400 U	400 U
Benzo(g,h,i)perylene	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Benzo(k)fluoranthene	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Bis(2-chloro-1-methylethyl) ether	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Butylbenzylphthalate	52 J	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Caprolactam	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Carbazole	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Chrysene	430 U	390 U	410 U	400 U	410 U	35 J	400 U	400 U
Di-n-butylphthalate	640	390 U	33 J	400 U	26 J	28 J	39 J	30 J
Di-n-octylphthalate	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Dibenz(a,h)anthracene	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Dibenzofuran	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Diethylphthalate	40 J	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Dimethyl phthalate	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Fluoranthene	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Fluorene	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Hexachlorobenzene	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Hexachlorobutadiene	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U

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Appendix C-2
Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SO22	IS28SO24	IS28SO26	IS28SO27	IS28SO29	IS28SO32	IS28SO33	
Sample ID	IS28SB22-0103	IS28SB24-0103	IS28SB26-0103	IS28SB27-0103	IS28SB29-0103	IS28SB32-0103	IS28SB33-0103	IS28SB33-0103P
Sample Date	05/14/03	05/14/03	05/19/03	05/16/03	05/19/03	05/19/03	05/19/03	05/19/03
Chemical Name								
Hexachlorocyclopentadiene	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Hexachloroethane	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Indeno(1,2,3-cd)pyrene	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Isophorone	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Naphthalene	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Nitrobenzene	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Pentachlorophenol	1,100 U	980 U	1,000 U	1,000 U	1,000 U	1,100 U	1,000 U	1,000 U
Phenanthrene	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Phenol	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Pyrene	430 U	390 U	410 U	400 U	410 U	32 J	400 U	400 U
bis(2-Chloroethoxy)methane	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
bis(2-Chloroethyl)ether	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
bis(2-Ethylhexyl)phthalate	430 U	390 U	61 B	61 J	410 U	45 B	400 U	47 B
n-Nitroso-di-n-propylamine	430 U	390 U	410 UL	400 U	410 U	430 U	400 U	400 U
n-Nitrosodiphenylamine	430 U	390 U	410 U	400 U	410 U	430 U	400 U	400 U
Explosives (UG/KG)								
1,3,5-Trinitrobenzene	100 U	100 U	100 U	100 U	100 U	100 UL	100 UL	100 UL
1,3-Dinitrobenzene	100 U	100 U	100 U	100 UL	100 U	100 U	100 U	100 U
2,4,6-Trinitrotoluene	110 L	100 UL	100 U	100 UL	100 U	100 U	43 J	100 U
2,4-Dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2,6-Dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-Amino-4,6-dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
2-Nitrotoluene	200 U	200 U	200 U	200 UL	200 U	200 U	200 U	200 U
3-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
4-Amino-2,6-dinitrotoluene	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U
4-Nitrotoluene	200 U	200 U	200 U	200 U	200 U	200 U	200 U	200 U
HMX	200 U	200 U	200 U	200 UL	200 U	200 U	200 U	200 U
Nitrobenzene	100 UL	100 UL	100 U	100 UL	100 U	100 U	100 U	100 U
Nitroglycerin	8,400 U	5,900 U	5,700 U	6,800 U	6,400 U	7,600 U	6,300 U	6,100 U
Nitroguanidine	130 U	130 U	130 UL	130 U	130 UL	130 U	130 U	130 U
PETN	500 U	500 U	500 U	500 U	500 U	500 U	500 U	500 U
Perchlorate	40 U	40 U	40 U	41 U	40 U	200 U	41 U	41 U
RDX	200 U	200 U	200 U	200 UL	200 U	200 U	200 U	200 U
Tetryl	54 J	200 U	200 U	200 U	200 U	200 UL	200 UL	200 UL

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Appendix C-2
Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SO22	IS28SO24	IS28SO26	IS28SO27	IS28SO29	IS28SO32	IS28SO33	
Sample ID	IS28SB22-0103	IS28SB24-0103	IS28SB26-0103	IS28SB27-0103	IS28SB29-0103	IS28SB32-0103	IS28SB33-0103	IS28SB33-0103P
Sample Date	05/14/03	05/14/03	05/19/03	05/16/03	05/19/03	05/19/03	05/19/03	05/19/03
Chemical Name								
Total Metals (MG/KG)								
Aluminum	8,570	4,380	2,340 J	4,170	3,080 J	4,290	1,510	1,660
Antimony	0.31 R	0.19 R	0.27 R	0.29 U	0.44 B	0.27 R	0.25 R	0.33 B
Arsenic	2.6 K	6.4 L	10 L	36	2.8 L	3.9 L	1.7 J	1.7 J
Barium	33.2 J	15.8 J	25.1 J	34.7 J	21.1 J	35.9 J	13.2 J	13.8 J
Beryllium	0.44 B	0.14 B	0.11 B	0.45 B	0.2 B	0.35 B	0.14 B	0.13 B
Cadmium	0.85 U	0.53 U	5.1	0.79 U	0.06 U	0.73 U	0.68 U	0.77 U
Calcium	76.9 J	50.1 J	502 J	205 J	157 J	272 J	112 J	116 J
Chromium	9	7.5	6 J	4.8	4.2 J	7.7 J	2.9 J	2.5 J
Cobalt	7.1 J	0.77 B	2.3 J	3.6 J	1.7 J	3.1 J	2.6 J	2.2 J
Copper	11.4	5	17	7.5 K	3.6 J	11.8	3.2 J	3.4 J
Iron	12,100	13,200	8,830	5,480	2,860	11,700	1,280	1,400
Lead	6.6	5.1	132 K	8.2	5.8 K	12	5.9	5
Magnesium	1,170 J	235 J	351 J	411 J	211 J	369 J	125 J	132 J
Manganese	35.6	4.2 K	69.9 J	36	21.9 J	62.2	10.9	11.1
Mercury	0.03 B	0.01 U	0.11 B	0.01 U	0.03 B	0.29	0.01 U	0.03 B
Nickel	6.3 J	3.5 J	3.8 J	5.2 B	2.33 U	4 J	2.5 J	2.47 U
Potassium	1,080 J	361 J	356 J	276 B	323 J	471 J	265 J	242 J
Selenium	0.49 U	0.47 J	0.43 U	0.46 U	0.42 U	0.52 J	0.39 U	0.44 U
Silver	1.11 U	1.1 J	0.98 U	1.04 U	0.95 U	0.96 U	0.89 U	1.01 U
Sodium	39.2 B	23.1 B	21.4 B	43.6 B	37.6 B	61.6 J	31.6 B	29.5 B
Thallium	0.87 J	0.43 U	0.86 B	0.65 U	0.59 UL	0.6 U	0.56 U	0.63 U
Vanadium	24.5	20.1	14 J	14.2 K	10.8 J	19.2 K	7.8 J	7.4 J
Zinc	42.9	20.7	4,670	74.2	23.4	18.1	7.3 K	7.4 K
Wet Chemistry (MG/KG)								
% Solids	60	85	88	74	79	66	79	82

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Appendix C-2
Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SO35		IS28SO36		IS28SO37		IS28SO38		IS28SO40		IS28SO41	
Sample ID	IS28SB35-0103		IS28SB36-0103		IS28SB37-0103		IS28SB38-0103		IS28SB40-0103		IS28SB41-0103	
Sample Date	05/19/03		05/19/03		05/19/03		05/19/03		05/19/03		05/19/03	
Chemical Name												
Volatile Organic Compounds (UG/KG)												
1,1,1-Trichloroethane	15	U	13	U	17	UL	26	U	13	UL	13	UL
1,1,2,2-Tetrachloroethane	15	U	13	U	17	UL	26	U	13	UL	13	UL
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	15	U	13	U	17	UL	26	U	13	UL	13	UL
1,1,2-Trichloroethane	15	U	13	U	17	UL	26	U	13	UL	13	UL
1,1-Dichloroethane	15	U	13	U	17	UL	26	U	13	UL	13	UL
1,1-Dichloroethene	15	U	13	U	17	UL	26	U	13	UL	13	UL
1,2,4-Trichlorobenzene	15	U	13	U	17	UL	26	U	13	UL	13	UL
1,2-Dibromo-3-chloropropane	15	U	13	U	17	UL	26	U	13	UL	13	UL
1,2-Dibromoethane	15	U	13	U	17	UL	26	U	13	UL	13	UL
1,2-Dichlorobenzene	15	U	13	U	17	UL	26	U	13	UL	13	UL
1,2-Dichloroethane	15	U	13	U	17	UL	26	U	13	UL	13	UL
1,2-Dichloroethene (total)	2	J	2	B	2	B	5	B	2	L	3	B
1,2-Dichloropropane	15	U	13	U	17	UL	26	U	13	UL	13	UL
1,3-Dichlorobenzene	15	U	13	U	17	UL	26	U	13	UL	13	UL
1,4-Dichlorobenzene	15	U	13	U	17	UL	26	U	13	UL	13	UL
2-Butanone	15	U	13	U	17	UL	9	J	13	UL	13	UL
2-Hexanone	15	U	13	U	17	UL	26	U	13	UL	13	UL
4-Methyl-2-pentanone	15	U	13	U	17	UL	26	U	13	UL	13	UL
Acetone	10	B	7	B	4	B	42	B	9	B	17	B
Benzene	15	U	13	U	17	UL	26	U	13	UL	13	UL
Bromodichloromethane	15	U	13	U	17	UL	26	U	13	UL	13	UL
Bromoform	15	U	13	U	17	UL	26	U	13	UL	13	UL
Bromomethane	15	U	13	U	17	UL	26	U	13	UL	13	UL
Carbon disulfide	15	U	13	U	17	UL	26	U	13	UL	13	UL
Carbon tetrachloride	15	U	13	U	17	UL	26	U	13	UL	13	UL
Chlorobenzene	15	U	13	U	17	UL	26	U	13	UL	13	UL
Chloroethane	15	U	13	U	17	UL	26	U	13	UL	13	UL
Chloroform	15	U	13	U	17	UL	26	U	13	UL	13	UL
Chloromethane	15	U	13	U	17	UL	26	U	13	UL	13	UL
Cumene	15	U	13	U	17	UL	26	U	13	UL	13	UL
Cyclohexane	15	U	13	U	17	UL	26	U	13	UL	13	UL
Dibromochloromethane	15	U	13	U	17	UL	26	U	13	UL	13	UL
Dichlorodifluoromethane(Freon-12)	15	U	13	UJ	17	UJ	26	UJ	13	UL	13	UL

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UL

Appendix C-2
Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SO35		IS28SO36		IS28SO37		IS28SO38		IS28SO40		IS28SO41	
Sample ID	IS28SB35-0103		IS28SB36-0103		IS28SB37-0103		IS28SB38-0103		IS28SB40-0103		IS28SB41-0103	
Sample Date	05/19/03		05/19/03		05/19/03		05/19/03		05/19/03		05/19/03	
Chemical Name												
Ethylbenzene	15	U	13	U	17	UL	26	U	13	UL	13	UL
Methyl acetate	15	U	13	U	17	UL	26	U	13	UL	13	UL
Methyl-tert-butyl ether (MTBE)	3	J	3	J	17	UL	5	J	2	L	3	L
Methylcyclohexane	15	U	13	U	17	UL	26	U	13	UL	13	UL
Methylene chloride	21	B	10	B	11	B	21	B	24	B	17	B
Styrene	15	U	13	U	17	UL	26	U	13	UL	13	UL
Tetrachloroethene	15	U	13	U	17	UL	26	U	13	UL	13	UL
Toluene	15	UL	13	U	17	UL	26	U	13	UL	13	UL
Trichloroethene	15	U	13	U	17	UL	26	U	13	UL	2	B
Trichlorofluoromethane(Freon-11)	15	U	13	U	17	UL	26	U	13	UL	13	UL
Vinyl chloride	15	U	13	U	17	UL	26	U	13	UL	13	UL
Xylene, total	15	U	13	U	17	UL	26	U	13	UL	13	UL
cis-1,2-Dichloroethene	2	J	2	B	2	B	5	B	2	L	3	B
cis-1,3-Dichloropropene	15	U	13	U	17	UL	26	U	13	UL	13	UL
m- and p-Xylene	15	U	13	U	17	UL	26	U	13	UL	13	UL
o-Xylene	15	U	13	U	17	UL	26	U	13	UL	13	UL
trans-1,2-Dichloroethene	15	U	13	U	17	UL	26	U	13	UL	13	UL
trans-1,3-Dichloropropene	15	U	13	U	17	UL	26	U	13	UL	13	UL
Semi-volatile Organic Compounds (UG/KG)												
1,1-Biphenyl	500	U	410	U	530	U	960	U	440	U	440	U
2,4,5-Trichlorophenol	1,300	U	1,000	U	1,300	U	2,400	U	1,100	U	1,100	U
2,4,6-Trichlorophenol	500	U	410	U	530	U	960	U	440	U	440	U
2,4-Dichlorophenol	500	U	410	U	530	U	960	U	440	U	440	U
2,4-Dimethylphenol	500	U	410	U	530	U	960	U	440	U	440	U
2,4-Dinitrophenol	1,300	U	1,000	U	1,300	U	2,400	U	1,100	U	1,100	U
2,4-Dinitrotoluene	500	U	410	U	530	U	960	U	440	U	440	U
2,6-Dinitrotoluene	500	U	410	U	530	U	960	U	440	U	440	U
2-Chloronaphthalene	500	U	410	U	530	U	960	U	440	U	440	U
2-Chlorophenol	500	U	410	U	530	U	960	U	440	U	440	U
2-Methylnaphthalene	500	U	410	U	530	U	960	U	440	U	440	U
2-Methylphenol	500	U	410	U	530	U	960	U	440	U	440	U
2-Nitroaniline	1,300	U	1,000	U	1,300	U	2,400	U	1,100	U	1,100	U
2-Nitrophenol	500	U	410	U	530	U	960	U	440	U	440	U
3,3'-Dichlorobenzidine	500	U	410	U	530	U	960	U	440	U	440	U

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Appendix C-2
Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SO35		IS28SO36		IS28SO37		IS28SO38		IS28SO40		IS28SO41	
Sample ID	IS28SB35-0103		IS28SB36-0103		IS28SB37-0103		IS28SB38-0103		IS28SB40-0103		IS28SB41-0103	
Sample Date	05/19/03		05/19/03		05/19/03		05/19/03		05/19/03		05/19/03	
Chemical Name												
3-Nitroaniline	1,300	U	1,000	U	1,300	U	2,400	U	1,100	U	1,100	U
4,6-Dinitro-2-methylphenol	1,300	U	1,000	U	1,300	U	2,400	U	1,100	U	1,100	U
4-Bromophenyl-phenylether	500	U	410	U	530	U	960	U	440	U	440	U
4-Chloro-3-methylphenol	500	U	410	U	530	U	960	U	440	U	440	U
4-Chloroaniline	500	U	410	U	530	U	960	U	440	U	440	U
4-Chlorophenyl-phenylether	500	U	410	U	530	U	960	U	440	U	440	U
4-Methylphenol	500	U	410	U	530	U	960	U	440	U	440	U
4-Nitroaniline	1,300	U	1,000	U	1,300	U	2,400	U	1,100	U	1,100	U
4-Nitrophenol	1,300	U	1,000	U	1,300	U	2,400	U	1,100	U	1,100	U
Acenaphthene	500	U	410	U	530	U	960	U	440	U	440	U
Acenaphthylene	500	U	410	U	530	U	960	U	440	U	440	U
Acetophenone	500	U	410	U	530	U	960	U	440	U	440	U
Anthracene	500	U	410	U	530	U	960	U	440	U	440	U
Atrazine	500	U	410	U	530	U	960	U	440	U	440	U
Benzaldehyde	500	U	410	U	530	U	960	U	440	U	26	J
Benzo(a)anthracene	500	U	410	U	530	U	960	U	440	U	440	U
Benzo(a)pyrene	500	U	410	U	530	U	960	U	440	U	440	U
Benzo(b)fluoranthene	500	U	410	U	530	U	960	U	440	U	440	U
Benzo(g,h,i)perylene	500	U	410	U	530	U	960	U	440	U	440	U
Benzo(k)fluoranthene	500	U	410	U	530	U	960	U	440	U	440	U
Bis(2-chloro-1-methylethyl) ether	500	U	410	U	530	U	960	U	440	U	440	U
Butylbenzylphthalate	500	U	410	U	530	U	960	U	440	U	440	U
Caprolactam	500	U	410	U	530	U	960	U	440	U	440	U
Carbazole	500	U	410	U	530	U	960	U	440	U	440	U
Chrysene	500	U	410	U	530	U	960	U	440	U	440	U
Di-n-butylphthalate	40	J	410	U	530	U	960	U	440	U	65	J
Di-n-octylphthalate	500	U	410	U	530	U	960	U	440	U	440	U
Dibenz(a,h)anthracene	500	U	410	U	530	U	960	U	440	U	440	U
Dibenzofuran	500	U	410	U	530	U	960	U	440	U	440	U
Diethylphthalate	500	U	410	U	530	U	960	U	440	U	440	U
Dimethyl phthalate	500	U	410	U	530	U	960	U	440	U	440	U
Fluoranthene	500	U	410	U	530	U	960	U	440	U	440	U
Fluorene	500	U	410	U	530	U	960	U	440	U	440	U
Hexachlorobenzene	500	U	410	U	530	U	960	U	440	U	440	U
Hexachlorobutadiene	500	U	410	U	530	U	960	U	440	U	440	U

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Appendix C-2
Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SO35		IS28SO36		IS28SO37		IS28SO38		IS28SO40		IS28SO41	
Sample ID	IS28SB35-0103		IS28SB36-0103		IS28SB37-0103		IS28SB38-0103		IS28SB40-0103		IS28SB41-0103	
Sample Date	05/19/03		05/19/03		05/19/03		05/19/03		05/19/03		05/19/03	
Chemical Name												
Hexachlorocyclopentadiene	500	U	410	U	530	U	960	U	440	U	440	U
Hexachloroethane	500	U	410	U	530	U	960	U	440	U	440	U
Indeno(1,2,3-cd)pyrene	500	U	410	U	530	U	960	U	440	U	440	U
Isophorone	500	U	410	U	530	U	960	U	440	U	440	U
Naphthalene	500	U	410	U	530	U	960	U	440	U	440	U
Nitrobenzene	500	U	410	U	530	U	960	U	440	U	440	U
Pentachlorophenol	1,300	U	1,000	U	1,300	U	2,400	U	1,100	U	1,100	U
Phenanthrene	500	U	410	U	530	U	960	U	440	U	440	U
Phenol	500	U	410	U	530	U	960	U	440	U	440	U
Pyrene	500	U	410	U	530	U	960	U	440	U	440	U
bis(2-Chloroethoxy)methane	500	U	410	U	530	U	960	U	440	U	440	U
bis(2-Chloroethyl)ether	500	U	410	U	530	U	960	U	440	U	440	U
bis(2-Ethylhexyl)phthalate	72	B	44	B	120	B	110	B	440	U	440	U
n-Nitroso-di-n-propylamine	500	U	410	U	530	U	960	U	440	U	440	U
n-Nitrosodiphenylamine	500	U	410	U	530	U	960	U	440	U	440	U
Explosives (UG/KG)												
1,3,5-Trinitrobenzene	100	UL	100	UL	100	UL	100	UL	100	UL	100	UL
1,3-Dinitrobenzene	100	U	100	U	100	U	100	U	100	U	100	U
2,4,6-Trinitrotoluene	120		100	U	100	U	100	U	100	U	100	U
2,4-Dinitrotoluene	100	U	100	U	100	U	100	U	100	U	100	U
2,6-Dinitrotoluene	100	U	100	U	100	U	100	U	100	U	100	U
2-Amino-4,6-dinitrotoluene	100	U	100	U	100	U	100	U	100	U	100	U
2-Nitrotoluene	200	U	200	U	200	U	200	U	200	U	200	U
3-Nitrotoluene	200	U	200	U	200	U	200	U	200	U	200	U
4-Amino-2,6-dinitrotoluene	100	U	100	U	100	U	100	U	100	U	100	U
4-Nitrotoluene	200	U	200	U	200	U	200	U	200	U	200	U
HMX	200	U	200	U	200	U	200	U	200	U	200	U
Nitrobenzene	100	U	100	U	100	U	100	U	100	U	100	U
Nitroglycerin	7,100	U	7,600	U	6,900	U	6,200	U	6,300	U	6,800	U
Nitroguanidine	130	U	130	U	130	U	130	U	130	U	130	U
PETN	500	U	500	U	500	U	500	U	500	U	500	U
Perchlorate	41	U	40	U	41	U	45	U	40	U	42	U
RDX	200	U	200	U	200	U	200	U	200	U	200	U
Tetryl	200	UL	200	UL	200	UL	200	UL	200	UL	200	UL

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Appendix C-2
Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SO35	IS28SO36	IS28SO37	IS28SO38	IS28SO40	IS28SO41
Sample ID	IS28SB35-0103	IS28SB36-0103	IS28SB37-0103	IS28SB38-0103	IS28SB40-0103	IS28SB41-0103
Sample Date	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03	05/19/03
Chemical Name						
Total Metals (MG/KG)						
Aluminum	2,640	1,630	10,700	7,250	7,490	10,100
Antimony	0.3 R	0.29 R	0.32 R	0.69 R	0.32 R	0.31 R
Arsenic	1.1 J	1.6 J	1.4 J	5.2 L	1.1 J	3.9 L
Barium	25.1 J	14.5 J	50.2	91.2 J	62.8	57.1
Beryllium	0.66 B	0.25 B	0.55 B	0.96 B	1.4 K	0.71 J
Cadmium	0.81 U	0.8 U	0.88 U	1.9 U	0.88 U	0.87 U
Calcium	596 J	99.3 J	170 J	1,140 J	1,880	496 J
Chromium	6.7 J	1.6 J	11 J	11.6 J	21.8 J	14.4 J
Cobalt	8 J	12.4 K	6.2 J	15.7 J	18.1 K	8.4 J
Copper	14.8	3.2 J	10.6 K	16.1 K	36.6	19.7
Iron	15,000	1,560	10,800	9,930	31,900	16,800
Lead	5.4	3.6	9.2	15	11.6	11.2
Magnesium	688 J	238 J	686 J	668 J	1,840	841 J
Manganese	41.8	31.6	35.4	77.5	71.6	51.2
Mercury	0.02 U	0.02 U	0.11 B	0.16 B	0.03 B	0.17
Nickel	4.5 J	4.5 J	7.8 J	16.4 J	13.4 K	11.5 K
Potassium	544 J	300 J	736 J	719 J	994 J	897 J
Selenium	0.47 U	0.46 U	0.51 U	1.09 U	0.5 U	0.5 U
Silver	1.06 U	1.05 U	1.15 U	2.48 U	1.14 U	1.13 U
Sodium	52.6 B	27.1 B	35.1 B	106 J	115 J	73.1 J
Thallium	0.98 B	0.65 B	0.88 B	1.6 B	1.3 B	0.99 B
Vanadium	29.3	4.4 J	27.6	27.1 K	83.8	32.1
Zinc	19.1	15.9	98.5	127	67.2	48.2
Wet Chemistry (MG/KG)						
% Solids	70	66	72	80	79	73

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Appendix C-3

Appendix C-3
Sediment Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SWSD01	IS28SWSD02		IS28SWSD03	IS28SD01		IS28SD02	
Sample ID	IS28SD01-0503	IS28SD02-0503	IS28SD02-0503P	IS28SD03-0503	IS28SD010006	IS28SD010612	IS28SD020006	IS28SD020612
Sample Date	05/21/03	05/21/03	05/21/03	05/20/03	05/12/03	05/12/03	05/12/03	05/12/03
Chemical Name								
Volatile Organic Compounds (UG/KG)								
1,1,1-Trichloroethane	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
1,1,2-Trichloroethane	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
1,1-Dichloroethane	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
1,1-Dichloroethene	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
1,2,4-Trichlorobenzene	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
1,2-Dibromoethane	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
1,2-Dichlorobenzene	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
1,2-Dichloroethane	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
1,2-Dichloroethene (total)	2 J	3 J	1 L	2 B	NA	NA	NA	NA
1,2-Dichloropropane	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
1,3-Dichlorobenzene	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
1,4-Dichlorobenzene	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
2-Butanone	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
2-Hexanone	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
4-Methyl-2-pentanone	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
Acetone	13 B	34 UJ	12 UJ	3 J	NA	NA	NA	NA
Benzene	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
Bromodichloromethane	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
Bromoform	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
Bromomethane	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
Carbon disulfide	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
Carbon tetrachloride	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
Chlorobenzene	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
Chloroethane	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
Chloroform	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
Chloromethane	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
Cumene	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
Cyclohexane	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
Dibromochloromethane	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
Dichlorodifluoromethane(Freon-12)	14 U	34 U	12 UL	13 UJ	NA	NA	NA	NA

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Appendix C-3
Sediment Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SWSD01	IS28SWSD02		IS28SWSD03	IS28SD01		IS28SD02	
Sample ID	IS28SD01-0503	IS28SD02-0503	IS28SD02-0503P	IS28SD03-0503	IS28SD010006	IS28SD010612	IS28SD020006	IS28SD020612
Sample Date	05/21/03	05/21/03	05/21/03	05/20/03	05/12/03	05/12/03	05/12/03	05/12/03
Chemical Name								
Ethylbenzene	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
Methyl acetate	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	14 U	34 U	12 UL	5 L	NA	NA	NA	NA
Methylcyclohexane	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
Methylene chloride	6 B	67 B	20 B	10 B	NA	NA	NA	NA
Styrene	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
Tetrachloroethene	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
Toluene	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
Trichloroethene	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
Trichlorofluoromethane(Freon-11)	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
Vinyl chloride	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
Xylene, total	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
cis-1,2-Dichloroethene	2 J	3 J	1 L	2 B	NA	NA	NA	NA
cis-1,3-Dichloropropene	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
m- and p-Xylene	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
o-Xylene	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
trans-1,2-Dichloroethene	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
trans-1,3-Dichloropropene	14 U	34 U	12 UL	13 UL	NA	NA	NA	NA
Semi-volatile Organic Compounds (UG/KG)								
1,1-Biphenyl	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
2,4,5-Trichlorophenol	1,100 U	3,200 U	1,300 U	1,500 U	NA	NA	1,200 U	1,100 U
2,4,6-Trichlorophenol	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
2,4-Dichlorophenol	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
2,4-Dimethylphenol	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
2,4-Dinitrophenol	1,100 U	3,200 U	1,300 U	1,500 U	NA	NA	1,200 U	1,100 U
2,4-Dinitrotoluene	450 U	520 J	520 U	580 U	NA	NA	460 U	430 U
2,6-Dinitrotoluene	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
2-Chloronaphthalene	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
2-Chlorophenol	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
2-Methylnaphthalene	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
2-Methylphenol	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
2-Nitroaniline	1,100 U	3,200 U	1,300 U	1,500 U	NA	NA	1,200 U	1,100 U
2-Nitrophenol	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
3,3'-Dichlorobenzidine	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U

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Appendix C-3
Sediment Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SWSD01	IS28SWSD02		IS28SWSD03	IS28SD01		IS28SD02	
Sample ID	IS28SD01-0503	IS28SD02-0503	IS28SD02-0503P	IS28SD03-0503	IS28SD010006	IS28SD010612	IS28SD020006	IS28SD020612
Sample Date	05/21/03	05/21/03	05/21/03	05/20/03	05/12/03	05/12/03	05/12/03	05/12/03
Chemical Name								
3-Nitroaniline	1,100 U	3,200 U	1,300 U	1,500 U	NA	NA	1,200 U	1,100 U
4,6-Dinitro-2-methylphenol	1,100 U	3,200 U	1,300 U	1,500 U	NA	NA	1,200 U	1,100 U
4-Bromophenyl-phenylether	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
4-Chloro-3-methylphenol	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
4-Chloroaniline	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
4-Chlorophenyl-phenylether	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
4-Methylphenol	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
4-Nitroaniline	1,100 U	3,200 U	1,300 U	1,500 U	NA	NA	1,200 U	1,100 U
4-Nitrophenol	1,100 U	3,200 U	1,300 U	1,500 U	NA	NA	1,200 U	1,100 U
Acenaphthene	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
Acenaphthylene	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
Acetophenone	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
Anthracene	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
Atrazine	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
Benzaldehyde	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
Benzo(a)anthracene	450 U	140 J	520 U	140 J	NA	NA	460 U	430 U
Benzo(a)pyrene	450 U	130 J	520 U	83 J	NA	NA	460 U	430 U
Benzo(b)fluoranthene	49 J	250 J	520 U	140 J	NA	NA	460 U	430 U
Benzo(g,h,i)perylene	450 U	1,200 U	520 U	36 J	NA	NA	460 U	430 U
Benzo(k)fluoranthene	450 U	1,200 U	520 U	71 J	NA	NA	460 U	430 U
Bis(2-chloro-1-methylethyl) ether	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
Butylbenzylphthalate	450 U	1,200 U	520 U	580 U	NA	NA	28 J	430 U
Caprolactam	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
Carbazole	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
Chrysene	30 J	160 J	520 U	150 J	NA	NA	460 U	430 U
Di-n-butylphthalate	26 J	110 J	520 U	47 J	NA	NA	43 B	430 U
Di-n-octylphthalate	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
Dibenz(a,h)anthracene	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
Dibenzofuran	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
Diethylphthalate	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
Dimethyl phthalate	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
Fluoranthene	37 J	220 J	520 U	200 J	NA	NA	460 U	430 U
Fluorene	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
Hexachlorobenzene	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
Hexachlorobutadiene	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U

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Appendix C-3
Sediment Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SWSD01	IS28SWSD02		IS28SWSD03	IS28SD01		IS28SD02	
Sample ID	IS28SD01-0503	IS28SD02-0503	IS28SD02-0503P	IS28SD03-0503	IS28SD010006	IS28SD010612	IS28SD020006	IS28SD020612
Sample Date	05/21/03	05/21/03	05/21/03	05/20/03	05/12/03	05/12/03	05/12/03	05/12/03
Chemical Name								
Hexachlorocyclopentadiene	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
Hexachloroethane	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
Indeno(1,2,3-cd)pyrene	450 U	93 J	520 U	46 J	NA	NA	460 U	430 U
Isophorone	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
Naphthalene	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
Nitrobenzene	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
Pentachlorophenol	1,100 U	3,200 U	1,300 U	1,500 U	NA	NA	1,200 U	1,100 U
Phenanthrene	450 U	72 J	520 U	580 U	NA	NA	460 U	430 U
Phenol	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
Pyrene	37 J	230 J	520 U	170 J	NA	NA	460 U	110 J
bis(2-Chloroethoxy)methane	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
bis(2-Chloroethyl)ether	450 U	1,200 U	520 U	580 U	NA	NA	460 U	430 U
bis(2-Ethylhexyl)phthalate	33 B	180 B	520 U	84 B	NA	NA	65 B	47 J
n-Nitroso-di-n-propylamine	450 UL	1,200 UL	520 UL	580 UL	NA	NA	460 U	430 U
n-Nitrosodiphenylamine	450 U	220 J	520 U	580 U	NA	NA	460 U	430 U
Explosives (UG/KG)								
1,3,5-Trinitrobenzene	100 U	100 U	100 U	100 U	NA	NA	100 U	100 U
1,3-Dinitrobenzene	100 U	100 U	100 U	100 U	NA	NA	100 U	100 U
2,4,6-Trinitrotoluene	100 U	100 U	100 U	100 U	NA	NA	100 UL	100 UL
2,4-Dinitrotoluene	100 U	130	100 U	100 U	NA	NA	100 U	100 U
2,6-Dinitrotoluene	100 U	100 U	100 U	100 U	NA	NA	100 U	100 U
2-Amino-4,6-dinitrotoluene	100 U	59 J	100 U	100 U	NA	NA	100 U	100 U
2-Nitrotoluene	200 UL	200 U	200 U	200 U	NA	NA	200 U	200 U
3-Nitrotoluene	200 UL	200 U	200 U	200 U	NA	NA	200 U	200 U
4-Amino-2,6-dinitrotoluene	100 U	110	100 U	100 U	NA	NA	100 U	100 U
4-Nitrotoluene	200 U	200 U	200 U	200 U	NA	NA	200 U	200 U
HMX	200 U	200 U	200 U	200 U	NA	NA	200 U	200 U
Nitrobenzene	100 U	100 U	100 U	100 U	NA	NA	100 UL	100 UL
Nitroglycerin	6,000 U	25,000 J	7,600 U	6,700 U	NA	NA	6,400 U	7,800 U
Nitroguanidine	130 U	130 U	130 U	130 U	NA	NA	130 U	130 U
PETN	500 U	500 U	500 U	500 U	NA	NA	500 U	500 U
Perchlorate	40 U	49 U	41 U	40 U	NA	NA	40 U	40 U
RDX	200 U	200 U	200 U	200 U	NA	NA	200 U	200 U
Tetryl	200 U	200 U	200 U	200 U	NA	NA	200 U	200 U

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Appendix C-3
Sediment Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SWSD01	IS28SWSD02		IS28SWSD03	IS28SD01		IS28SD02	
Sample ID	IS28SD01-0503	IS28SD02-0503	IS28SD02-0503P	IS28SD03-0503	IS28SD010006	IS28SD010612	IS28SD020006	IS28SD020612
Sample Date	05/21/03	05/21/03	05/21/03	05/20/03	05/12/03	05/12/03	05/12/03	05/12/03
Chemical Name								
Total Metals (MG/KG)								
Aluminum	1,420 J	13,400 J	5,660 J	2,990 J	1,910	1,290	1,970	3,360
Antimony	0.3 UL	0.66 UL	0.33 UL	0.43 UL	0.31 UL	0.23 UL	0.29 UL	0.2 UL
Arsenic	13.3 J	220 J	58.1 J	80.4 J	0.96 B	0.67 B	11.4	5
Barium	24 J	166	75	31.1 J	17.9 J	13.5 J	16.6 J	22.9 J
Beryllium	0.27 B	0.91 B	0.3 B	0.38 B	0.15 J	0.13 J	0.26 J	0.23 J
Cadmium	4.2 J	25.3 J	28 J	12 J	0.85 U	0.63 U	0.81 U	0.56 U
Calcium	1,450	1,240 J	712 J	405 J	245 J	89.8 J	270 J	205 J
Chromium	15 J	18.3 J	8.2 J	5.2 J	3.4 K	5.9	9.6	5.3
Cobalt	6.5 J	11.7 J	4.8 J	4.6 J	3 J	3.9 J	2.2 J	4.7 J
Copper	38.8 J	111 J	41.3 J	67.5 J	2.8 B	1.7 B	3.8 J	3.4 J
Iron	8,960 J	31,900 J	8,740 J	6,880 J	1,850	1,370	3,830	2,610
Lead	76.8 J	827 J	278 J	437 J	7.6 K	3.7 K	20.7 K	5.6 K
Magnesium	1,160	1,080 J	459 J	267 J	224 J	135 J	239 J	272 J
Manganese	104 K	251 K	89.6 K	100 K	28.7	14.3	40.6	16
Mercury	0.12 B	0.48	0.38	0.05 B	0.04 B	0.02 B	0.05 B	0.04 B
Nickel	44.4 J	16 J	8.1 J	4.3 J	4.9 J	2 U	4.6 J	4.3 J
Potassium	114 U	614 J	280 J	253 J	166 J	87.7 U	114 J	212 J
Selenium	0.48 J	2 J	0.76 J	0.67 U	0.49 U	0.36 U	0.46 U	0.48 B
Silver	1.1 J	2.37 U	1.18 U	1.54 U	1.12 U	0.82 U	1.1 J	0.9 J
Sodium	40.2 B	147 B	72.6 B	55 B	36.6 B	22 B	34.9 B	38.1 B
Thallium	0.66 U	1.48 U	0.73 U	0.96 U	1.4 B	0.65 B	0.66 U	0.74 B
Vanadium	5.3 B	39.3 K	10.5 J	10 J	7.5 J	5.6 J	7.9 J	9.6 K
Zinc	1,420 J	14,200 J	7,480 J	6,770 J	11.9	5.1 K	138	79.4
Wet Chemistry (MG/KG)								
% Solids	83	38	66	74	77	82	78	64
Total organic carbon (TOC)	12,000	82,000	31,000	32,000	NA	NA	8,100	6,000
pH	6.1	6.7	7.1	6.6	NA	NA	NA	NA

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Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SD03		IS28SD04				IS28SD05	
Sample ID	IS28SD030006	IS28SD030612	IS28SD40612	IS28SD40612P	IS28SD040006	IS28SD040006P	IS28SD050006	IS28SD050612
Sample Date	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03
Chemical Name								
Volatile Organic Compounds (UG/KG)								
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Cumene	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane(Freon-12)	NA	NA	NA	NA	NA	NA	NA	NA

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Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SD03		IS28SD04				IS28SD05	
Sample ID	IS28SD030006	IS28SD030612	IS28SD40612	IS28SD40612P	IS28SD040006	IS28SD040006P	IS28SD050006	IS28SD050612
Sample Date	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03
Chemical Name								
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane(Freon-11)	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	NA	NA	NA
Xylene, total	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA
m- and p-Xylene	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA
Semi-volatile Organic Compounds (UG/KG)								
1,1-Biphenyl	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	NA	NA	NA

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Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SD03		IS28SD04				IS28SD05	
Sample ID	IS28SD030006	IS28SD030612	IS28SD40612	IS28SD40612P	IS28SD040006	IS28SD040006P	IS28SD050006	IS28SD050612
Sample Date	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03
Chemical Name								
3-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	NA	NA	NA	NA	NA	NA	NA	NA
Acetophenone	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Atrazine	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloro-1-methylethyl) ether	NA	NA	NA	NA	NA	NA	NA	NA
Butylbenzylphthalate	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	NA	NA	NA	NA	NA	NA	NA	NA
Carbazole	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzofuran	NA	NA	NA	NA	NA	NA	NA	NA
Diethylphthalate	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	NA	NA	NA

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Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SD03		IS28SD04				IS28SD05	
Sample ID	IS28SD030006	IS28SD030612	IS28SD40612	IS28SD40612P	IS28SD040006	IS28SD040006P	IS28SD050006	IS28SD050612
Sample Date	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03
Chemical Name								
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA
Isophorone	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA
Phenol	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	NA	NA	NA
Explosives (UG/KG)								
1,3,5-Trinitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrotoluene	NA	NA	NA	NA	NA	NA	NA	NA
HMX	NA	NA	NA	NA	NA	NA	NA	NA
Nitrobenzene	NA	NA	NA	NA	NA	NA	NA	NA
Nitroglycerin	NA	NA	NA	NA	NA	NA	NA	NA
Nitroguanidine	NA	NA	NA	NA	NA	NA	NA	NA
PETN	NA	NA	NA	NA	NA	NA	NA	NA
Perchlorate	NA	NA	NA	NA	NA	NA	NA	NA
RDX	NA	NA	NA	NA	NA	NA	NA	NA
Tetryl	NA	NA	NA	NA	NA	NA	NA	NA

NA - Not analyzed
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UL

Appendix C-3
Sediment Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SD03		IS28SD04				IS28SD05	
Sample ID	IS28SD030006	IS28SD030612	IS28SD40612	IS28SD40612P	IS28SD040006	IS28SD040006P	IS28SD050006	IS28SD050612
Sample Date	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03
Chemical Name								
Total Metals (MG/KG)								
Aluminum	3,270 J	1,250 J	3,130 J	2,020 J	4,650 J	3,630 J	4,460 J	11,200 J
Antimony	0.29 UL	0.26 UL	0.31 UL	0.46 J	0.4 J	0.32 UL	0.33 UL	0.36 UL
Arsenic	14.8 J	7.8 J	27.4 J	11.3 J	15.5 J	16.5 J	36.7 J	22.5 J
Barium	35.6 J	8.8 J	41.4 J	35.4 J	99.8	97.7	38.8 J	78.1
Beryllium	0.24 B	0.06 B	0.21 B	0.08 B	0.25 B	0.2 B	0.22 B	0.58 B
Cadmium	9.5 J	6 J	12.9 J	7.3 J	8.6 J	9.1 J	11.9 J	7.9 J
Calcium	468 J	112 B	596 J	352 J	589 J	598 J	503 J	839 J
Chromium	14.3 J	5.9 J	8.3 J	6.4 J	11.1 J	9.8 J	8.5 J	16.7 J
Cobalt	4.7 J	1.4 J	4.5 J	2.8 J	4 J	4.2 J	4.1 J	8.1 J
Copper	51.7 J	18.5 J	40.5 J	33.6 J	82.6 J	74.4 J	89.9 J	34.5 J
Iron	17,900 J	11,100 J	9,390 J	8,130 J	10,100 J	10,100 J	11,100 J	15,900 J
Lead	423 J	321 J	386 J	276 J	464 J	402 J	716 J	194 J
Magnesium	594 J	125 J	564 J	555 J	699 J	617 J	612 J	1,240 J
Manganese	351 K	26.4 K	61.2 K	53.3 K	118 K	121 K	168 K	171 K
Mercury	0.09 B	0.04 B	0.14 B	0.1 B	0.37	0.38	0.11 B	0.13 B
Nickel	16.2 J	2.8 J	8.4 J	8.8 J	7.6 J	8.9 J	6.5 J	11.2 J
Potassium	219 J	99.3 U	321 J	204 J	409 J	368 J	284 J	694 J
Selenium	0.82 J	0.41 U	0.5 J	0.9 J	0.8 J	0.62 J	0.85 J	0.72 J
Silver	1.04 U	0.93 U	1.11 U	1.07 U	1.21 U	1.16 U	1.2 U	1.4 J
Sodium	51.9 B	20.9 B	39.2 B	28.5 B	58.3 B	53.5 B	65.4 B	113 B
Thallium	0.65 U	0.58 U	0.69 U	0.67 U	0.75 U	0.73 U	0.75 U	0.81 U
Vanadium	13.8 K	7.6 J	11.9 J	8.6 J	14 K	12.6 K	14.1 K	24.4
Zinc	8,190 J	4,440 J	6,490 J	4,580 J	4,640 J	4,670 J	10,700 J	4,500 J
Wet Chemistry (MG/KG)								
% Solids	66	84	71	69	69	71	62	64
Total organic carbon (TOC)	NA	NA	NA	NA	NA	NA	NA	NA
pH	NA	NA	NA	NA	NA	NA	NA	NA

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Appendix C-3
Sediment Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SD06		IS28SD07		IS28SD08	IS28SD09		IS28
Sample ID	IS28SD060006	IS28SD060612	IS28SD070006	IS28SD070612	IS28SD080006	IS28SD090006	IS28SD090612	IS28SD100006
Sample Date	05/13/03	05/13/03	05/13/03	05/13/03	05/13/03	05/13/03	05/13/03	05/14/03
Chemical Name								
Volatile Organic Compounds (UG/KG)								
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Cumene	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane(Freon-12)	NA	NA	NA	NA	NA	NA	NA	NA

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Appendix C-3
Sediment Raw Data
Remedial Investigation Report Site 28
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Station ID	IS28SD06		IS28SD07		IS28SD08	IS28SD09		IS28
Sample ID	IS28SD060006	IS28SD060612	IS28SD070006	IS28SD070612	IS28SD080006	IS28SD090006	IS28SD090612	IS28SD100006
Sample Date	05/13/03	05/13/03	05/13/03	05/13/03	05/13/03	05/13/03	05/13/03	05/14/03
Chemical Name								
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane(Freon-11)	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	NA	NA	NA
Xylene, total	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA
m- and p-Xylene	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA
Semi-volatile Organic Compounds (UG/KG)								
1,1-Biphenyl	NA	NA	NA	NA	NA	400 U	410 U	NA
2,4,5-Trichlorophenol	NA	NA	NA	NA	NA	1,000 U	1,000 U	NA
2,4,6-Trichlorophenol	NA	NA	NA	NA	NA	400 U	410 U	NA
2,4-Dichlorophenol	NA	NA	NA	NA	NA	400 U	410 U	NA
2,4-Dimethylphenol	NA	NA	NA	NA	NA	400 U	410 U	NA
2,4-Dinitrophenol	NA	NA	NA	NA	NA	1,000 U	1,000 U	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	400 U	410 U	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	400 U	410 U	NA
2-Chloronaphthalene	NA	NA	NA	NA	NA	400 U	410 U	NA
2-Chlorophenol	NA	NA	NA	NA	NA	400 U	410 U	NA
2-Methylnaphthalene	NA	NA	NA	NA	NA	400 U	410 U	NA
2-Methylphenol	NA	NA	NA	NA	NA	400 U	410 U	NA
2-Nitroaniline	NA	NA	NA	NA	NA	1,000 U	1,000 U	NA
2-Nitrophenol	NA	NA	NA	NA	NA	400 U	410 U	NA
3,3'-Dichlorobenzidine	NA	NA	NA	NA	NA	400 U	410 U	NA

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Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SD06		IS28SD07		IS28SD08	IS28SD09		IS28
Sample ID	IS28SD060006	IS28SD060612	IS28SD070006	IS28SD070612	IS28SD080006	IS28SD090006	IS28SD090612	IS28SD100006
Sample Date	05/13/03	05/13/03	05/13/03	05/13/03	05/13/03	05/13/03	05/13/03	05/14/03
Chemical Name								
3-Nitroaniline	NA	NA	NA	NA	NA	1,000 U	1,000 U	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA	NA	NA	1,000 U	1,000 U	NA
4-Bromophenyl-phenylether	NA	NA	NA	NA	NA	400 U	410 U	NA
4-Chloro-3-methylphenol	NA	NA	NA	NA	NA	400 U	410 U	NA
4-Chloroaniline	NA	NA	NA	NA	NA	400 U	410 U	NA
4-Chlorophenyl-phenylether	NA	NA	NA	NA	NA	400 U	410 U	NA
4-Methylphenol	NA	NA	NA	NA	NA	400 U	410 U	NA
4-Nitroaniline	NA	NA	NA	NA	NA	1,000 U	1,000 U	NA
4-Nitrophenol	NA	NA	NA	NA	NA	1,000 U	1,000 U	NA
Acenaphthene	NA	NA	NA	NA	NA	400 U	410 U	NA
Acenaphthylene	NA	NA	NA	NA	NA	400 U	410 U	NA
Acetophenone	NA	NA	NA	NA	NA	400 U	410 U	NA
Anthracene	NA	NA	NA	NA	NA	400 U	410 U	NA
Atrazine	NA	NA	NA	NA	NA	400 U	410 U	NA
Benzaldehyde	NA	NA	NA	NA	NA	400 U	410 U	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	400 U	410 U	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	400 U	410 U	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	400 U	410 U	NA
Benzo(g,h,i)perylene	NA	NA	NA	NA	NA	400 U	410 U	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	400 U	410 U	NA
Bis(2-chloro-1-methylethyl) ether	NA	NA	NA	NA	NA	400 U	410 U	NA
Butylbenzylphthalate	NA	NA	NA	NA	NA	400 U	410 U	NA
Caprolactam	NA	NA	NA	NA	NA	400 U	410 U	NA
Carbazole	NA	NA	NA	NA	NA	400 U	410 U	NA
Chrysene	NA	NA	NA	NA	NA	400 U	410 U	NA
Di-n-butylphthalate	NA	NA	NA	NA	NA	400 U	410 U	NA
Di-n-octylphthalate	NA	NA	NA	NA	NA	400 U	410 U	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	400 U	410 U	NA
Dibenzofuran	NA	NA	NA	NA	NA	400 U	410 U	NA
Diethylphthalate	NA	NA	NA	NA	NA	37 J	410 U	NA
Dimethyl phthalate	NA	NA	NA	NA	NA	400 U	410 U	NA
Fluoranthene	NA	NA	NA	NA	NA	400 U	410 U	NA
Fluorene	NA	NA	NA	NA	NA	400 U	410 U	NA
Hexachlorobenzene	NA	NA	NA	NA	NA	400 U	410 U	NA
Hexachlorobutadiene	NA	NA	NA	NA	NA	400 U	410 U	NA

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Appendix C-3
Sediment Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SD06		IS28SD07		IS28SD08	IS28SD09		IS28
Sample ID	IS28SD060006	IS28SD060612	IS28SD070006	IS28SD070612	IS28SD080006	IS28SD090006	IS28SD090612	IS28SD100006
Sample Date	05/13/03	05/13/03	05/13/03	05/13/03	05/13/03	05/13/03	05/13/03	05/14/03
Chemical Name								
Hexachlorocyclopentadiene	NA	NA	NA	NA	NA	400 U	410 U	NA
Hexachloroethane	NA	NA	NA	NA	NA	400 U	410 U	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	400 U	410 U	NA
Isophorone	NA	NA	NA	NA	NA	400 U	410 U	NA
Naphthalene	NA	NA	NA	NA	NA	400 U	410 U	NA
Nitrobenzene	NA	NA	NA	NA	NA	400 U	410 U	NA
Pentachlorophenol	NA	NA	NA	NA	NA	1,000 U	1,000 U	NA
Phenanthrene	NA	NA	NA	NA	NA	400 U	410 U	NA
Phenol	NA	NA	NA	NA	NA	400 U	410 U	NA
Pyrene	NA	NA	NA	NA	NA	400 U	410 U	NA
bis(2-Chloroethoxy)methane	NA	NA	NA	NA	NA	400 U	410 U	NA
bis(2-Chloroethyl)ether	NA	NA	NA	NA	NA	400 U	410 U	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA	NA	NA	29 J	410 U	NA
n-Nitroso-di-n-propylamine	NA	NA	NA	NA	NA	400 U	410 U	NA
n-Nitrosodiphenylamine	NA	NA	NA	NA	NA	400 U	410 U	NA
Explosives (UG/KG)								
1,3,5-Trinitrobenzene	NA	NA	NA	NA	NA	100 U	100 U	NA
1,3-Dinitrobenzene	NA	NA	NA	NA	NA	100 U	100 U	NA
2,4,6-Trinitrotoluene	NA	NA	NA	NA	NA	100 UL	100 UL	NA
2,4-Dinitrotoluene	NA	NA	NA	NA	NA	100 U	100 U	NA
2,6-Dinitrotoluene	NA	NA	NA	NA	NA	100 U	100 U	NA
2-Amino-4,6-dinitrotoluene	NA	NA	NA	NA	NA	100 U	100 U	NA
2-Nitrotoluene	NA	NA	NA	NA	NA	200 U	200 U	NA
3-Nitrotoluene	NA	NA	NA	NA	NA	200 U	200 U	NA
4-Amino-2,6-dinitrotoluene	NA	NA	NA	NA	NA	100 U	100 U	NA
4-Nitrotoluene	NA	NA	NA	NA	NA	200 U	200 U	NA
HMX	NA	NA	NA	NA	NA	200 U	200 U	NA
Nitrobenzene	NA	NA	NA	NA	NA	100 U	100 U	NA
Nitroglycerin	NA	NA	NA	NA	NA	5,700 U	6,200 U	NA
Nitroguanidine	NA	NA	NA	NA	NA	130 U	130 U	NA
PETN	NA	NA	NA	NA	NA	500 U	500 U	NA
Perchlorate	NA	NA	NA	NA	NA	40 U	40 U	NA
RDX	NA	NA	NA	NA	NA	200 U	200 U	NA
Tetryl	NA	NA	NA	NA	NA	200 U	200 U	NA

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Appendix C-3
Sediment Raw Data
Remedial Investigation Report Site 28
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Station ID	IS28SD06		IS28SD07		IS28SD08	IS28SD09		IS28
Sample ID	IS28SD060006	IS28SD060612	IS28SD070006	IS28SD070612	IS28SD080006	IS28SD090006	IS28SD090612	IS28SD100006
Sample Date	05/13/03	05/13/03	05/13/03	05/13/03	05/13/03	05/13/03	05/13/03	05/14/03
Chemical Name								
Total Metals (MG/KG)								
Aluminum	4,940	9,170	3,450	7,410	1,120	3,960	5,030	2,940 J
Antimony	0.26 UL	0.29 UL	0.26 UL	0.31 UL	0.22 UL	0.27 UL	0.24 UL	0.41 UL
Arsenic	2.2	5.2	1.2 B	3.3 K	1.3 B	1.6 B	1.6 B	1.2 J
Barium	40.7	47.3	25.4 J	52.8	11.6 J	22 J	24.4 J	23 J
Beryllium	0.73 J	0.97 J	0.32 J	0.79 J	0.16 J	0.24 J	0.21 J	0.22 B
Cadmium	0.71 U	0.8 U	0.72 U	0.85 U	0.62 U	0.74 U	0.67 U	0.37 B
Calcium	1,450	835 J	778 J	812 J	307 J	470 J	498 J	770 J
Chromium	10.2	16.2	7	12	3.8	6.6	8.7	6.1 J
Cobalt	11.7 K	29.3	1.6 J	3 J	3.5 J	6.3 J	3.9 J	5.1 J
Copper	10.8	15.1	4.8 J	4.9 J	5.7 K	6.8 K	7.8 K	6.1 J
Iron	21,800	39,600	7,260	25,400	4,020	12,700	6,600	3,500 J
Lead	6.6 K	8.1 K	6 K	9.9 K	8.6 K	6.3 K	5.5 K	8.6 J
Magnesium	929 J	1,030 J	580 J	733 J	182 J	466 J	559 J	460 J
Manganese	284	192	57.1	63	68.1	351	26.3	61.4 K
Mercury	0.02 B	0.08 B	0.05 B	0.06 B	0.03 B	0.05 B	0.03 B	0.07 B
Nickel	5.9 J	11.1 K	2.4 J	5.1 J	3.6 J	4.1 J	2.6 J	4.5 J
Potassium	559 J	530 J	444 J	648 J	86.6 U	323 J	374 J	158 U
Selenium	0.41 U	0.46 U	0.62 B	0.49 U	0.35 U	0.43 U	0.61 B	0.85 J
Silver	1.8 J	2.4 K	0.99 J	2.2 J	1.1 J	1.4 J	0.92 J	1.48 U
Sodium	129 B	184 B	163 B	179 B	32.6 B	82.1 B	138 B	85.1 B
Thallium	0.97 B	1.4 B	0.58 U	0.69 U	0.5 U	0.61 U	0.83 B	0.92 U
Vanadium	28.2	35.3	22.6	37.9	4.2 J	15.7 K	22	11.2 J
Zinc	26.4	31.3	8.3 K	13.6	48.8	17.8	10 K	39.7 J
Wet Chemistry (MG/KG)								
% Solids	65	74	73	69	86	88	81	51
Total organic carbon (TOC)	NA	NA	NA	NA	NA	2,200	1,000	NA
pH	NA	NA	NA	NA	NA	NA	NA	NA

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Appendix C-3
Sediment Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	SD10	IS28SD11		IS28SD12		IS28SD13		IS28
Sample ID	IS28SD100612	IS28SD110006	IS28SD110612	IS28SD120006	IS28SD120612	IS28SD130006	IS28SD130612	IS28SD140006
Sample Date	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03
Chemical Name								
Volatile Organic Compounds (UG/KG)								
1,1,1-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2,2-Tetrachloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromo-3-chloropropane	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethene (total)	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloropropane	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone	NA	NA	NA	NA	NA	NA	NA	NA
2-Hexanone	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	NA	NA	NA	NA	NA	NA	NA	NA
Chlorobenzene	NA	NA	NA	NA	NA	NA	NA	NA
Chloroethane	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	NA	NA	NA	NA	NA	NA	NA	NA
Chloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Cumene	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane(Freon-12)	NA	NA	NA	NA	NA	NA	NA	NA

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Appendix C-3
Sediment Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	SD10	IS28SD11		IS28SD12		IS28SD13		IS28
Sample ID	IS28SD100612	IS28SD110006	IS28SD110612	IS28SD120006	IS28SD120612	IS28SD130006	IS28SD130612	IS28SD140006
Sample Date	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03
Chemical Name								
Ethylbenzene	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	NA	NA	NA	NA	NA	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	NA	NA	NA	NA	NA	NA	NA	NA
Toluene	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane(Freon-11)	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	NA	NA	NA	NA	NA	NA	NA	NA
Xylene, total	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA
m- and p-Xylene	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA	NA	NA	NA	NA	NA
Semi-volatile Organic Compounds (UG/KG)								
1,1-Biphenyl	NA	1,000 U	890 U	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	NA	2,500 U	2,200 U	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	NA	1,000 U	890 U	NA	NA	NA	NA	NA
2,4-Dichlorophenol	NA	1,000 U	890 U	NA	NA	NA	NA	NA
2,4-Dimethylphenol	NA	1,000 U	890 U	NA	NA	NA	NA	NA
2,4-Dinitrophenol	NA	2,500 U	2,200 U	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	1,000 U	890 U	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	1,000 U	890 U	NA	NA	NA	NA	NA
2-Chloronaphthalene	NA	1,000 U	890 U	NA	NA	NA	NA	NA
2-Chlorophenol	NA	1,000 U	890 U	NA	NA	NA	NA	NA
2-Methylnaphthalene	NA	1,000 U	890 U	NA	NA	NA	NA	NA
2-Methylphenol	NA	1,000 U	890 U	NA	NA	NA	NA	NA
2-Nitroaniline	NA	2,500 U	2,200 U	NA	NA	NA	NA	NA
2-Nitrophenol	NA	1,000 U	890 U	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	NA	1,000 U	890 U	NA	NA	NA	NA	NA

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Station ID	SD10	IS28SD11		IS28SD12		IS28SD13		IS28
Sample ID	IS28SD100612	IS28SD110006	IS28SD110612	IS28SD120006	IS28SD120612	IS28SD130006	IS28SD130612	IS28SD140006
Sample Date	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03
Chemical Name								
3-Nitroaniline	NA	2,500 U	2,200 U	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	2,500 U	2,200 U	NA	NA	NA	NA	NA
4-Bromophenyl-phenylether	NA	1,000 U	890 U	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	NA	1,000 U	890 U	NA	NA	NA	NA	NA
4-Chloroaniline	NA	1,000 U	890 U	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	NA	1,000 U	890 U	NA	NA	NA	NA	NA
4-Methylphenol	NA	1,000 U	890 U	NA	NA	NA	NA	NA
4-Nitroaniline	NA	2,500 U	2,200 U	NA	NA	NA	NA	NA
4-Nitrophenol	NA	2,500 U	2,200 U	NA	NA	NA	NA	NA
Acenaphthene	NA	1,000 U	890 U	NA	NA	NA	NA	NA
Acenaphthylene	NA	1,000 U	890 U	NA	NA	NA	NA	NA
Acetophenone	NA	1,000 U	890 U	NA	NA	NA	NA	NA
Anthracene	NA	1,000 U	890 U	NA	NA	NA	NA	NA
Atrazine	NA	1,000 U	890 U	NA	NA	NA	NA	NA
Benzaldehyde	NA	160 J	160 J	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	1,000 U	100 J	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	1,000 U	100 J	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	70 J	64 J	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	NA	1,000 U	80 J	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	1,000 U	890 U	NA	NA	NA	NA	NA
Bis(2-chloro-1-methylethyl) ether	NA	1,000 U	890 U	NA	NA	NA	NA	NA
Butylbenzylphthalate	NA	1,000 U	63 J	NA	NA	NA	NA	NA
Caprolactam	NA	1,000 U	890 U	NA	NA	NA	NA	NA
Carbazole	NA	1,000 U	890 U	NA	NA	NA	NA	NA
Chrysene	NA	67 J	890 U	NA	NA	NA	NA	NA
Di-n-butylphthalate	NA	52 B	65 B	NA	NA	NA	NA	NA
Di-n-octylphthalate	NA	1,000 U	890 U	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	1,000 U	890 U	NA	NA	NA	NA	NA
Dibenzofuran	NA	1,000 U	890 U	NA	NA	NA	NA	NA
Diethylphthalate	NA	1,000 U	890 U	NA	NA	NA	NA	NA
Dimethyl phthalate	NA	1,000 U	890 U	NA	NA	NA	NA	NA
Fluoranthene	NA	92 J	64 J	NA	NA	NA	NA	NA
Fluorene	NA	1,000 U	890 U	NA	NA	NA	NA	NA
Hexachlorobenzene	NA	1,000 U	890 U	NA	NA	NA	NA	NA
Hexachlorobutadiene	NA	1,000 U	890 U	NA	NA	NA	NA	NA

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Station ID	SD10	IS28SD11		IS28SD12		IS28SD13		IS28
Sample ID	IS28SD100612	IS28SD110006	IS28SD110612	IS28SD120006	IS28SD120612	IS28SD130006	IS28SD130612	IS28SD140006
Sample Date	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03
Chemical Name								
Hexachlorocyclopentadiene	NA	1,000 U	890 U	NA	NA	NA	NA	NA
Hexachloroethane	NA	1,000 U	890 U	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	1,000 U	890 U	NA	NA	NA	NA	NA
Isophorone	NA	1,000 U	890 U	NA	NA	NA	NA	NA
Naphthalene	NA	1,000 U	890 U	NA	NA	NA	NA	NA
Nitrobenzene	NA	1,000 U	890 U	NA	NA	NA	NA	NA
Pentachlorophenol	NA	2,500 U	2,200 U	NA	NA	NA	NA	NA
Phenanthrene	NA	1,000 U	890 U	NA	NA	NA	NA	NA
Phenol	NA	1,000 U	890 U	NA	NA	NA	NA	NA
Pyrene	NA	97 J	120 J	NA	NA	NA	NA	NA
bis(2-Chloroethoxy)methane	NA	1,000 U	890 U	NA	NA	NA	NA	NA
bis(2-Chloroethyl)ether	NA	1,000 U	890 U	NA	NA	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	140 B	190 B	NA	NA	NA	NA	NA
n-Nitroso-di-n-propylamine	NA	1,000 U	890 U	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	NA	79 J	890 U	NA	NA	NA	NA	NA
Explosives (UG/KG)								
1,3,5-Trinitrobenzene	NA	100 U	100 U	NA	NA	NA	NA	NA
1,3-Dinitrobenzene	NA	100 U	100 U	NA	NA	NA	NA	NA
2,4,6-Trinitrotoluene	NA	100 UL	100 UL	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	NA	100 U	100 U	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	NA	100 U	100 U	NA	NA	NA	NA	NA
2-Amino-4,6-dinitrotoluene	NA	100 U	100 U	NA	NA	NA	NA	NA
2-Nitrotoluene	NA	200 U	200 U	NA	NA	NA	NA	NA
3-Nitrotoluene	NA	200 U	200 U	NA	NA	NA	NA	NA
4-Amino-2,6-dinitrotoluene	NA	100 U	100 U	NA	NA	NA	NA	NA
4-Nitrotoluene	NA	200 U	200 U	NA	NA	NA	NA	NA
HMX	NA	200 U	200 U	NA	NA	NA	NA	NA
Nitrobenzene	NA	100 U	100 U	NA	NA	NA	NA	NA
Nitroglycerin	NA	14,000 U	15,000 U	NA	NA	NA	NA	NA
Nitroguanidine	NA	130 U	130 U	NA	NA	NA	NA	NA
PETN	NA	500 U	500 UL	NA	NA	NA	NA	NA
Perchlorate	NA	80 U	81 U	NA	NA	NA	NA	NA
RDX	NA	200 U	200 U	NA	NA	NA	NA	NA
Tetryl	NA	200 U	200 U	NA	NA	NA	NA	NA

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Station ID	SD10	IS28SD11		IS28SD12		IS28SD13		IS28
Sample ID	IS28SD100612	IS28SD110006	IS28SD110612	IS28SD120006	IS28SD120612	IS28SD130006	IS28SD130612	IS28SD140006
Sample Date	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03	05/14/03
Chemical Name								
Total Metals (MG/KG)								
Aluminum	3,370 J	11,700	10,500	18,400	16,600	14,200	14,900	17,100
Antimony	0.34 UL	0.6 UL	0.6 UL	0.5 UL	0.43 UL	0.71 UL	0.39 UL	0.43 UL
Arsenic	1.1 J	8.2 K	7.3 K	6.7 K	4 K	7.9 K	4.9 K	5.7 K
Barium	25.7 J	95.5	90.5	134	115	112	110	119
Beryllium	0.34 B	0.87 J	0.8 J	1 J	0.97 J	1 J	0.94 J	0.89 J
Cadmium	0.08 B	1.64 U	1.65 U	1.37 U	1.18 U	1.94 U	1.07 U	1.19 U
Calcium	873 J	2,060 J	1,840 J	1,770 J	1,290 J	2,050 J	1,530	1,350 J
Chromium	5.5 J	23	20.1	27.8	25.1	26	24.7	26.7
Cobalt	4.6 J	12.6 J	11.4 J	12.9 J	10.8 J	13.2 J	12.3 J	10.9 J
Copper	5.3 J	23.9	24.3	17.3 K	13.2 K	23 K	13.8 K	13 K
Iron	2,620 J	20,200	19,300	23,900	21,600	26,600	23,700	23,400
Lead	6 J	36.7 K	35.8 K	20.6 K	13.8 K	27.9 K	16 K	15 K
Magnesium	496 J	1,880 J	1,740 J	2,510	2,130	2,540 J	2,120	2,220
Manganese	34.3 K	397	412	478	238	891	481	386
Mercury	0.06 B	0.44 K	0.11 B	0.34 B	0.12 B	0.35 B	0.16 B	0.16 B
Nickel	3.9 J	20.2 K	20.5 K	20.9 K	17.2 K	17.6 J	18.5 K	16.3 K
Potassium	226 J	911 J	756 J	1,150 J	1,060 J	1,120 J	924 J	1,230 J
Selenium	0.64 J	1.5 B	0.95 U	0.85 B	0.68 U	1.11 U	0.62 U	0.68 U
Silver	1.23 U	4 J	3.8 J	2.4 J	1.8 J	3.3 J	2.7 J	2.1 J
Sodium	152 B	349 B	323 B	336 B	281 B	464 B	343 B	285 B
Thallium	0.77 U	1.5 B	1.35 U	1.5 B	0.96 U	1.6 B	1.5 B	1.7 B
Vanadium	10.6 J	32.1 K	31.4 K	38.2	33.8	33.6 K	30.7	36
Zinc	15.2 B	159	116	82.5	48.6	117	63	51
Wet Chemistry (MG/KG)								
% Solids	66	35	33	37	53	31	46	52
Total organic carbon (TOC)	NA	72,000	58,000	NA	NA	NA	NA	NA
pH	NA	NA	NA	NA	NA	NA	NA	NA

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Sediment Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	SD14		IS28SD15			
Sample ID	IS28SD140612		IS28SD150006		IS28SD150612	
Sample Date	05/14/03		05/14/03		05/14/03	
Chemical Name						
Volatile Organic Compounds (UG/KG)						
1,1,1-Trichloroethane	NA		NA		NA	
1,1,2,2-Tetrachloroethane	NA		NA		NA	
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NA		NA		NA	
1,1,2-Trichloroethane	NA		NA		NA	
1,1-Dichloroethane	NA		NA		NA	
1,1-Dichloroethene	NA		NA		NA	
1,2,4-Trichlorobenzene	NA		NA		NA	
1,2-Dibromo-3-chloropropane	NA		NA		NA	
1,2-Dibromoethane	NA		NA		NA	
1,2-Dichlorobenzene	NA		NA		NA	
1,2-Dichloroethane	NA		NA		NA	
1,2-Dichloroethene (total)	NA		NA		NA	
1,2-Dichloropropane	NA		NA		NA	
1,3-Dichlorobenzene	NA		NA		NA	
1,4-Dichlorobenzene	NA		NA		NA	
2-Butanone	NA		NA		NA	
2-Hexanone	NA		NA		NA	
4-Methyl-2-pentanone	NA		NA		NA	
Acetone	NA		NA		NA	
Benzene	NA		NA		NA	
Bromodichloromethane	NA		NA		NA	
Bromoform	NA		NA		NA	
Bromomethane	NA		NA		NA	
Carbon disulfide	NA		NA		NA	
Carbon tetrachloride	NA		NA		NA	
Chlorobenzene	NA		NA		NA	
Chloroethane	NA		NA		NA	
Chloroform	NA		NA		NA	
Chloromethane	NA		NA		NA	
Cumene	NA		NA		NA	
Cyclohexane	NA		NA		NA	
Dibromochloromethane	NA		NA		NA	
Dichlorodifluoromethane(Freon-12)	NA		NA		NA	

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Sediment Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	SD14	IS28SD15	
Sample ID	IS28SD140612	IS28SD150006	IS28SD150612
Sample Date	05/14/03	05/14/03	05/14/03
Chemical Name			
Ethylbenzene	NA	NA	NA
Methyl acetate	NA	NA	NA
Methyl-tert-butyl ether (MTBE)	NA	NA	NA
Methylcyclohexane	NA	NA	NA
Methylene chloride	NA	NA	NA
Styrene	NA	NA	NA
Tetrachloroethene	NA	NA	NA
Toluene	NA	NA	NA
Trichloroethene	NA	NA	NA
Trichlorofluoromethane(Freon-11)	NA	NA	NA
Vinyl chloride	NA	NA	NA
Xylene, total	NA	NA	NA
cis-1,2-Dichloroethene	NA	NA	NA
cis-1,3-Dichloropropene	NA	NA	NA
m- and p-Xylene	NA	NA	NA
o-Xylene	NA	NA	NA
trans-1,2-Dichloroethene	NA	NA	NA
trans-1,3-Dichloropropene	NA	NA	NA
Semi-volatile Organic Compounds (UG/KG)			
1,1-Biphenyl	NA	NA	NA
2,4,5-Trichlorophenol	NA	NA	NA
2,4,6-Trichlorophenol	NA	NA	NA
2,4-Dichlorophenol	NA	NA	NA
2,4-Dimethylphenol	NA	NA	NA
2,4-Dinitrophenol	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA
2-Chloronaphthalene	NA	NA	NA
2-Chlorophenol	NA	NA	NA
2-Methylnaphthalene	NA	NA	NA
2-Methylphenol	NA	NA	NA
2-Nitroaniline	NA	NA	NA
2-Nitrophenol	NA	NA	NA
3,3'-Dichlorobenzidine	NA	NA	NA

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Sediment Raw Data
Remedial Investigation Report Site 28
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Station ID	SD14	IS28SD15	
Sample ID	IS28SD140612	IS28SD150006	IS28SD150612
Sample Date	05/14/03	05/14/03	05/14/03
Chemical Name			
3-Nitroaniline	NA	NA	NA
4,6-Dinitro-2-methylphenol	NA	NA	NA
4-Bromophenyl-phenylether	NA	NA	NA
4-Chloro-3-methylphenol	NA	NA	NA
4-Chloroaniline	NA	NA	NA
4-Chlorophenyl-phenylether	NA	NA	NA
4-Methylphenol	NA	NA	NA
4-Nitroaniline	NA	NA	NA
4-Nitrophenol	NA	NA	NA
Acenaphthene	NA	NA	NA
Acenaphthylene	NA	NA	NA
Acetophenone	NA	NA	NA
Anthracene	NA	NA	NA
Atrazine	NA	NA	NA
Benzaldehyde	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA
Benzo(g,h,i)perylene	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA
Bis(2-chloro-1-methylethyl) ether	NA	NA	NA
Butylbenzylphthalate	NA	NA	NA
Caprolactam	NA	NA	NA
Carbazole	NA	NA	NA
Chrysene	NA	NA	NA
Di-n-butylphthalate	NA	NA	NA
Di-n-octylphthalate	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA
Dibenzofuran	NA	NA	NA
Diethylphthalate	NA	NA	NA
Dimethyl phthalate	NA	NA	NA
Fluoranthene	NA	NA	NA
Fluorene	NA	NA	NA
Hexachlorobenzene	NA	NA	NA
Hexachlorobutadiene	NA	NA	NA

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Sediment Raw Data
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IHDIV-NSWC

Station ID	SD14	IS28SD15	
Sample ID	IS28SD140612	IS28SD150006	IS28SD150612
Sample Date	05/14/03	05/14/03	05/14/03
Chemical Name			
Hexachlorocyclopentadiene	NA	NA	NA
Hexachloroethane	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA
Isophorone	NA	NA	NA
Naphthalene	NA	NA	NA
Nitrobenzene	NA	NA	NA
Pentachlorophenol	NA	NA	NA
Phenanthrene	NA	NA	NA
Phenol	NA	NA	NA
Pyrene	NA	NA	NA
bis(2-Chloroethoxy)methane	NA	NA	NA
bis(2-Chloroethyl)ether	NA	NA	NA
bis(2-Ethylhexyl)phthalate	NA	NA	NA
n-Nitroso-di-n-propylamine	NA	NA	NA
n-Nitrosodiphenylamine	NA	NA	NA
Explosives (UG/KG)			
1,3,5-Trinitrobenzene	NA	NA	NA
1,3-Dinitrobenzene	NA	NA	NA
2,4,6-Trinitrotoluene	NA	NA	NA
2,4-Dinitrotoluene	NA	NA	NA
2,6-Dinitrotoluene	NA	NA	NA
2-Amino-4,6-dinitrotoluene	NA	NA	NA
2-Nitrotoluene	NA	NA	NA
3-Nitrotoluene	NA	NA	NA
4-Amino-2,6-dinitrotoluene	NA	NA	NA
4-Nitrotoluene	NA	NA	NA
HMX	NA	NA	NA
Nitrobenzene	NA	NA	NA
Nitroglycerin	NA	NA	NA
Nitroguanidine	NA	NA	NA
PETN	NA	NA	NA
Perchlorate	NA	NA	NA
RDX	NA	NA	NA
Tetryl	NA	NA	NA

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low

U - Analyte not detected
UJ
UL

Appendix C-3
Sediment Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	SD14	IS28SD15	
Sample ID	IS28SD140612	IS28SD150006	IS28SD150612
Sample Date	05/14/03	05/14/03	05/14/03
Chemical Name			
Total Metals (MG/KG)			
Aluminum	17,900 J	10,500	16,500 J
Antimony	0.4 UL	0.5 UL	0.42 UL
Arsenic	4.5 J	6 K	5.3 J
Barium	133	95.9	112
Beryllium	0.95 B	0.72 J	0.81 B
Cadmium	0.67 B	1.39 U	0.62 B
Calcium	1,410 J	1,520 J	1,290 J
Chromium	26.5 J	19.2	26.4 J
Cobalt	11.4 J	10.4 J	10.9 J
Copper	15 J	15.1 K	14.7 J
Iron	27,800 J	19,500	24,500 J
Lead	15.6 J	18 K	16.3 J
Magnesium	2,270	1,620 J	2,090
Manganese	484 K	448	303 K
Mercury	0.09 B	0.25 B	0.12 B
Nickel	15.9 J	14.7 J	16.9 J
Potassium	1,200 J	770 J	939 J
Selenium	1.2 J	0.83 B	1.4 J
Silver	1.45 U	2.9 J	1.51 U
Sodium	315 B	226 B	247 B
Thallium	1.2 J	1.7 B	1.6 J
Vanadium	39.1	26 K	37
Zinc	55.6 J	72.9	56.3 J
Wet Chemistry (MG/KG)			
% Solids	54	42	50
Total organic carbon (TOC)	NA	NA	NA
pH	NA	NA	NA

NA - Not analyzed
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J - Reported value is estimated
K - Reported value may be biased high
L - Reported value may be biased low

U - Analyte not detected
UJ
UL

Appendix C-4

Appendix C-4
In Situ Groundwater Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM02		IS28MM03		IS28MM05		IS28MM06		IS28MM07		IS28MM07		IS28MM11		IS28MM14	
Sample ID	IS28GW02-0503		IS28GW03-0503		IS28GW05-0503		IS28GW06-0503		IS28GW07-0503		IS28GW07-0503P		IS28GW11-0503		IS28GW14-0503	
Sample Date	05/12/03		05/12/03		05/12/03		05/15/03		05/16/03		05/16/03		05/21/03		05/15/03	
Chemical Name																
Volatile Organic Compounds (UG/L)																
1,1,1-Trichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,1,2,2-Tetrachloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,1,2-Trichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,1-Dichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,1-Dichloroethene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,2,4-Trichlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dibromo-3-chloropropane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dibromoethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dichlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dichloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dichloroethene (total)	NA		NA		NA		NA		NA		NA		10	U	NA	
1,2-Dichloropropane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,3-Dichlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
1,4-Dichlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
2-Butanone	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
2-Hexanone	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
4-Methyl-2-pentanone	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Acetone	5	J	10	U	4	J	10	U	10	U	10	U	10	U	4	J
Benzene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Bromodichloromethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Bromoform	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Bromomethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Carbon disulfide	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Carbon tetrachloride	10	U	5	J	2	J	2	J	10	U	1	J	10	U	10	U
Chlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Chloroethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Chloroform	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Chloromethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cumene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Cyclohexane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Dibromochloromethane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Dichlorodifluoromethane(Freon-12)	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Ethylbenzene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Methyl acetate	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Methyl-tert-butyl ether (MTBE)	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Methylcyclohexane	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Methylene chloride	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Styrene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Tetrachloroethene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Toluene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Trichloroethene	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
JB
U - Analyte not detected

Appendix C-4
In Situ Groundwater Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM02	IS28MM03	IS28MM05	IS28MM06	IS28MM07		IS28MM11	IS28MM14
Sample ID	IS28GW02-0503	IS28GW03-0503	IS28GW05-0503	IS28GW06-0503	IS28GW07-0503	IS28GW07-0503P	IS28GW11-0503	IS28GW14-0503
Sample Date	05/12/03	05/12/03	05/12/03	05/15/03	05/16/03	05/16/03	05/21/03	05/15/03
Chemical Name								
Trichlorofluoromethane(Freon-11)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl chloride	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Xylene, total	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
m- and p-Xylene	NA	NA	NA	NA	NA	NA	10 U	NA
o-Xylene	NA	NA	NA	NA	NA	NA	10 U	NA
trans-1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Semi-volatile Organic Compounds (UG/L)								
1,1-Biphenyl	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
2,4,5-Trichlorophenol	25 U	25 U	25 U	25 U	25 U	25 U	NA	25 U
2,4,6-Trichlorophenol	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
2,4-Dichlorophenol	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
2,4-Dimethylphenol	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
2,4-Dinitrophenol	25 U	25 U	25 U	25 U	25 U	25 U	NA	25 U
2,4-Dinitrotoluene	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
2,6-Dinitrotoluene	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
2-Chloronaphthalene	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
2-Chlorophenol	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
2-Methylnaphthalene	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
2-Methylphenol	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
2-Nitroaniline	25 U	25 U	25 U	25 U	25 U	25 U	NA	25 U
2-Nitrophenol	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
3,3'-Dichlorobenzidine	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
3-Nitroaniline	25 U	25 U	25 U	25 U	25 U	25 U	NA	25 U
4,6-Dinitro-2-methylphenol	25 U	25 U	25 U	25 U	25 U	25 U	NA	25 U
4-Bromophenyl-phenylether	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
4-Chloro-3-methylphenol	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
4-Chloroaniline	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
4-Chlorophenyl-phenylether	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
4-Methylphenol	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
4-Nitroaniline	25 U	25 U	25 U	25 U	25 U	25 U	NA	25 U
4-Nitrophenol	25 U	25 U	25 U	25 U	25 U	25 U	NA	25 U
Acenaphthene	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Acenaphthylene	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Acetophenone	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Anthracene	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Atrazine	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Benzaldehyde	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Benzo(a)anthracene	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Benzo(a)pyrene	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Benzo(b)fluoranthene	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U

NA - Not analyzed
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J - Reported value is estimated
JB
U - Analyte not detected

Appendix C-4
In Situ Groundwater Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM02	IS28MM03	IS28MM05	IS28MM06	IS28MM07		IS28MM11	IS28MM14
Sample ID	IS28GW02-0503	IS28GW03-0503	IS28GW05-0503	IS28GW06-0503	IS28GW07-0503	IS28GW07-0503P	IS28GW11-0503	IS28GW14-0503
Sample Date	05/12/03	05/12/03	05/12/03	05/15/03	05/16/03	05/16/03	05/21/03	05/15/03
Chemical Name								
Benzo(g,h,i)perylene	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Benzo(k)fluoranthene	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Bis(2-chloro-1-methylethyl) ether	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Butylbenzylphthalate	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Caprolactam	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Carbazole	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Chrysene	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Di-n-butylphthalate	10 U	10 U	1 J	0.6 JB	1 J	2 J	NA	10 U
Di-n-octylphthalate	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Dibenz(a,h)anthracene	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Dibenzofuran	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Diethylphthalate	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Dimethyl phthalate	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Fluoranthene	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Fluorene	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Hexachlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Hexachlorobutadiene	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Hexachlorocyclopentadiene	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Hexachloroethane	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Indeno(1,2,3-cd)pyrene	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Isophorone	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Naphthalene	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Nitrobenzene	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Pentachlorophenol	25 U	25 U	25 U	25 U	25 U	25 U	NA	25 U
Phenanthrene	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Phenol	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Pyrene	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
bis(2-Chloroethoxy)methane	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
bis(2-Chloroethyl)ether	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
bis(2-Ethylhexyl)phthalate	10 U	41	10 U	10 U	10 U	10 U	NA	10 U
n-Nitroso-di-n-propylamine	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
n-Nitrosodiphenylamine	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
Explosives (UG/L)								
1,3,5-Trinitrobenzene	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	NA	0.26 U
1,3-Dinitrobenzene	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	NA	0.26 U
2,4,6-Trinitrotoluene	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	NA	0.26 U
2,4-Dinitrotoluene	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	NA	0.26 U
2,6-Dinitrotoluene	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	NA	0.26 U
2-Amino-4,6-dinitrotoluene	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	NA	0.26 U
2-Nitrotoluene	0.52 U	0.52 U	0.52 U	0.52 U	0.52 U	0.52 U	NA	0.52 U
3-Nitrotoluene	0.52 U	0.52 U	0.52 U	0.52 U	0.52 U	0.52 U	NA	0.52 U
4-Amino-2,6-dinitrotoluene	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	NA	0.26 U
4-Nitrotoluene	0.52 U	0.52 U	0.52 U	0.52 U	0.52 U	0.52 U	NA	0.52 U

NA - Not analyzed
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JB
U - Analyte not detected

Appendix C-4
In Situ Groundwater Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM02	IS28MM03	IS28MM05	IS28MM06	IS28MM07		IS28MM11	IS28MM14
Sample ID	IS28GW02-0503	IS28GW03-0503	IS28GW05-0503	IS28GW06-0503	IS28GW07-0503	IS28GW07-0503P	IS28GW11-0503	IS28GW14-0503
Sample Date	05/12/03	05/12/03	05/12/03	05/15/03	05/16/03	05/16/03	05/21/03	05/15/03
Chemical Name								
HMX	0.52 U	0.52 U	0.52 U	0.52 U	0.52 U	0.52 U	NA	0.52 U
Nitrobenzene	0.26 U	0.26 U	0.26 U	0.26 U	0.23 J	0.26 U	NA	0.26 U
Nitroglycerin	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	NA	1,000 U
Nitroguanidine	10 U	10 U	10 U	10 U	10 U	10 U	NA	10 U
PETN	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	NA	1.3 U
Perchlorate	4 U	4 U	4 U	4 U	4 U	4 U	NA	4 U
RDX	0.52 U	0.52 U	0.52 U	0.52 U	0.52 U	0.52 U	NA	0.52 U
Tetryl	0.52 U	0.52 U	0.52 U	0.52 U	0.52 U	0.52 U	NA	0.52 U
Dissolved Metals (UG/L)								
Aluminum	35 B	31.7 B	20.8 B	36.7 B	75.6 B	35.3 B	12,000	62.2 B
Antimony	1.33 U	1.33 U	1.33 U	1.33 U	1.33 U	1.33 U	3.8 B	1.33 U
Arsenic	2.3 B	1.8 U	1.8 U	1.8 U	1.8 U	2.3 B	142	1.8 U
Barium	29.7 B	27.1 B	30.4 B	27.1 B	25.6 B	26.7 B	1,230	30.9 B
Beryllium	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U
Cadmium	3.66 U	3.66 U	3.66 U	3.66 U	3.66 U	3.66 U	22.8	3.66 U
Calcium	1,800 B	1,180 B	1,080 B	888 B	870 B	919 B	7,780	1,140 B
Chromium	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	17.9	0.57 U
Cobalt	3.9 B	3.8 B	7.4 B	2.1 B	2.7 B	2.5 B	8.4 B	3.5 B
Copper	2.38 U	2.38 U	2.38 U	2.38 U	2.38 U	3 B	61	2.38 U
Iron	1,080	332	208	328	218	312	16,400	359
Lead	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	367	0.91 U
Magnesium	881 B	834 B	814 B	647 B	614 B	641 B	3,280 B	701 B
Manganese	75.6	38.4	61	34.2	24.1	28.1	133	45.8
Mercury	0.08 B	0.03 U	0.05 B	0.06 B	0.08 B	0.03 U	0.25	0.1 B
Nickel	11.7 U	17.3 B	11.7 U	11.7 U	11.7 U	11.7 U	13.4 B	11.7 U
Potassium	2,780 B	2,210 B	1,880 B	1,700 B	1,530 B	1,860 B	3,300 B	2,840 B
Selenium	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U
Silver	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	4.78 U	0.57 U
Sodium	15,600	14,700	14,000	16,500	13,900	14,200	10,600	15,200
Thallium	6.6 B	4 B	6.1 B	6.7 B	4.1 B	7.9 B	5 B	3.8 B
Vanadium	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	30.4 B	4.7 U
Zinc	94	24.3	46.8	26.3	18.3 B	30.6	15,700	60.4
Wet Chemistry (MG/L)								
Dissolved organic carbon	NA	NA	NA	NA	NA	NA	NA	NA
Total organic carbon (TOC)	1	1 U	1 U	1	1 U	1 U	NA	1

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
JB
U - Analyte not detected

Appendix C-4
In Situ Groundwater Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM20		IS28MM23		IS28MM27		IS28MM27		IS28MM28		IS28MM42	
Sample ID	IS28GW20-0503		IS28GW23-0503		IS28GW27-0503		IS28GW27-0503P		IS28GW28-0503		IS28GW42-0503	
Sample Date	05/20/03		05/20/03		05/20/03		05/20/03		05/20/03		05/14/03	
Chemical Name												
Volatile Organic Compounds (UG/L)												
1,1,1-Trichloroethane	10	U	10	U	10	U	10	U	10	U	10	U
1,1,2,2-Tetrachloroethane	10	U	10	U	10	U	10	U	10	U	10	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10	U	10	U	10	U	10	U	10	U	10	U
1,1,2-Trichloroethane	10	U	10	U	10	U	10	U	10	U	10	U
1,1-Dichloroethane	10	U	10	U	10	U	10	U	10	U	10	U
1,1-Dichloroethene	10	U	10	U	10	U	10	U	10	U	10	U
1,2,4-Trichlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dibromo-3-chloropropane	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dibromoethane	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dichlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dichloroethane	10	U	10	U	10	U	10	U	10	U	10	U
1,2-Dichloroethene (total)	NA		NA		NA		NA		NA		NA	
1,2-Dichloropropane	10	U	10	U	10	U	10	U	10	U	10	U
1,3-Dichlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U
1,4-Dichlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U
2-Butanone	10	U	10	U	10	U	10	U	10	U	10	U
2-Hexanone	10	U	10	U	10	U	10	U	10	U	10	U
4-Methyl-2-pentanone	10	U	10	U	10	U	10	U	10	U	10	U
Acetone	5	J	10	U	10	U	10	U	10	U	10	U
Benzene	10	U	10	U	10	U	10	U	10	U	10	U
Bromodichloromethane	10	U	10	U	10	U	10	U	10	U	10	U
Bromoform	10	U	10	U	10	U	10	U	10	U	10	U
Bromomethane	10	U	10	U	10	U	10	U	10	U	10	U
Carbon disulfide	10	U	10	U	10	U	10	U	10	U	10	U
Carbon tetrachloride	10	U	10	U	2	J	2	J	10	U	10	U
Chlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U
Chloroethane	10	U	10	U	10	U	10	U	10	U	10	U
Chloroform	10	U	10	U	10	U	10	U	10	U	10	U
Chloromethane	10	U	10	U	10	U	10	U	10	U	10	U
Cumene	10	U	10	U	10	U	10	U	10	U	10	U
Cyclohexane	10	U	10	U	10	U	10	U	10	U	10	U
Dibromochloromethane	10	U	10	U	10	U	10	U	10	U	10	U
Dichlorodifluoromethane(Freon-12)	10	U	10	U	10	U	10	U	10	U	10	U
Ethylbenzene	10	U	10	U	10	U	10	U	10	U	10	U
Methyl acetate	10	U	10	U	10	U	10	U	10	U	10	U
Methyl-tert-butyl ether (MTBE)	10	U	10	U	10	U	10	U	10	U	10	U
Methylcyclohexane	10	U	10	U	10	U	10	U	10	U	10	U
Methylene chloride	10	U	1	JB	1	J	10	U	10	U	10	U
Styrene	10	U	10	U	10	U	10	U	10	U	10	U
Tetrachloroethene	10	U	10	U	10	U	10	U	10	U	10	U
Toluene	10	U	10	U	10	U	10	U	10	U	10	U
Trichloroethene	10	U	10	U	10	U	10	U	10	U	10	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
JB
U - Analyte not detected

Appendix C-4
In Situ Groundwater Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM20		IS28MM23		IS28MM27		IS28MM27		IS28MM28		IS28MM42	
Sample ID	IS28GW20-0503		IS28GW23-0503		IS28GW27-0503		IS28GW27-0503P		IS28GW28-0503		IS28GW42-0503	
Sample Date	05/20/03		05/20/03		05/20/03		05/20/03		05/20/03		05/14/03	
Chemical Name												
Trichlorofluoromethane(Freon-11)	10	U	10	U	10	U	10	U	10	U	10	U
Vinyl chloride	10	U	10	U	10	U	10	U	10	U	10	U
Xylene, total	10	U	10	U	10	U	10	U	10	U	10	U
cis-1,2-Dichloroethene	10	U	10	U	10	U	10	U	10	U	10	U
cis-1,3-Dichloropropene	10	U	10	U	10	U	10	U	10	U	10	U
m- and p-Xylene	NA		NA		NA		NA		NA		NA	
o-Xylene	NA		NA		NA		NA		NA		NA	
trans-1,2-Dichloroethene	10	U	10	U	10	U	10	U	10	U	10	U
trans-1,3-Dichloropropene	10	U	10	U	10	U	10	U	10	U	10	U
Semi-volatile Organic Compounds (UG/L)												
1,1-Biphenyl	10	U	10	U	10	U	10	U	10	U	10	U
2,4,5-Trichlorophenol	25	U	25	U	25	U	25	U	25	U	25	U
2,4,6-Trichlorophenol	10	U	10	U	10	U	10	U	10	U	10	U
2,4-Dichlorophenol	10	U	10	U	10	U	10	U	10	U	10	U
2,4-Dimethylphenol	10	U	10	U	10	U	10	U	10	U	10	U
2,4-Dinitrophenol	25	U	25	U	25	U	25	U	25	U	25	U
2,4-Dinitrotoluene	10	U	10	U	10	U	10	U	10	U	10	U
2,6-Dinitrotoluene	10	U	10	U	10	U	10	U	10	U	10	U
2-Chloronaphthalene	10	U	10	U	10	U	10	U	10	U	10	U
2-Chlorophenol	10	U	10	U	10	U	10	U	10	U	10	U
2-Methylnaphthalene	10	U	10	U	10	U	10	U	10	U	10	U
2-Methylphenol	10	U	10	U	10	U	10	U	10	U	10	U
2-Nitroaniline	25	U	25	U	25	U	25	U	25	U	25	U
2-Nitrophenol	10	U	10	U	10	U	10	U	10	U	10	U
3,3'-Dichlorobenzidine	10	U	10	U	10	U	10	U	10	U	10	U
3-Nitroaniline	25	U	25	U	25	U	25	U	25	U	25	U
4,6-Dinitro-2-methylphenol	25	U	25	U	25	U	25	U	25	U	25	U
4-Bromophenyl-phenylether	10	U	10	U	10	U	10	U	10	U	10	U
4-Chloro-3-methylphenol	10	U	10	U	10	U	10	U	10	U	10	U
4-Chloroaniline	10	U	10	U	10	U	10	U	10	U	10	U
4-Chlorophenyl-phenylether	10	U	10	U	10	U	10	U	10	U	10	U
4-Methylphenol	10	U	10	U	10	U	10	U	10	U	10	U
4-Nitroaniline	25	U	25	U	25	U	25	U	25	U	25	U
4-Nitrophenol	25	U	25	U	25	U	25	U	25	U	25	U
Acenaphthene	10	U	10	U	10	U	10	U	10	U	10	U
Acenaphthylene	10	U	10	U	10	U	10	U	10	U	10	U
Acetophenone	10	U	10	U	10	U	10	U	10	U	10	U
Anthracene	10	U	10	U	10	U	10	U	10	U	10	U
Atrazine	10	U	10	U	10	U	10	U	10	U	10	U
Benzaldehyde	10	U	10	U	10	U	10	U	10	U	10	U
Benzo(a)anthracene	10	U	10	U	10	U	10	U	10	U	10	U
Benzo(a)pyrene	10	U	10	U	10	U	10	U	10	U	10	U
Benzo(b)fluoranthene	10	U	10	U	10	U	10	U	10	U	10	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
JB
U - Analyte not detected

Appendix C-4
In Situ Groundwater Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM20		IS28MM23		IS28MM27		IS28MM27		IS28MM28		IS28MM42	
Sample ID	IS28GW20-0503		IS28GW23-0503		IS28GW27-0503		IS28GW27-0503P		IS28GW28-0503		IS28GW42-0503	
Sample Date	05/20/03		05/20/03		05/20/03		05/20/03		05/20/03		05/14/03	
Chemical Name												
Benzo(g,h,i)perylene	10	U	10	U	10	U	10	U	10	U	10	U
Benzo(k)fluoranthene	10	U	10	U	10	U	10	U	10	U	10	U
Bis(2-chloro-1-methylethyl) ether	10	U	10	U	10	U	10	U	10	U	10	U
Butylbenzylphthalate	10	U	10	U	10	U	10	U	10	U	10	U
Caprolactam	10	U	10	U	10	U	10	U	10	U	10	U
Carbazole	10	U	10	U	10	U	10	U	10	U	10	U
Chrysene	10	U	10	U	10	U	10	U	10	U	10	U
Di-n-butylphthalate	0.9	JB	1	JB	1	JB	10	U	0.9	JB	2	J
Di-n-octylphthalate	10	U	10	U	10	U	10	U	10	U	10	U
Dibenz(a,h)anthracene	10	U	10	U	10	U	10	U	10	U	10	U
Dibenzofuran	10	U	10	U	10	U	10	U	10	U	10	U
Diethylphthalate	10	U	10	U	10	U	10	U	10	U	10	U
Dimethyl phthalate	10	U	10	U	10	U	10	U	10	U	10	U
Fluoranthene	10	U	10	U	10	U	10	U	10	U	10	U
Fluorene	10	U	10	U	10	U	10	U	10	U	10	U
Hexachlorobenzene	10	U	10	U	10	U	10	U	10	U	10	U
Hexachlorobutadiene	10	U	10	U	10	U	10	U	10	U	10	U
Hexachlorocyclopentadiene	10	U	10	U	10	U	10	U	10	U	10	U
Hexachloroethane	10	U	10	U	10	U	10	U	10	U	10	U
Indeno(1,2,3-cd)pyrene	10	U	10	U	10	U	10	U	10	U	10	U
Isophorone	10	U	10	U	10	U	10	U	10	U	10	U
Naphthalene	10	U	10	U	10	U	10	U	10	U	10	U
Nitrobenzene	10	U	10	U	10	U	10	U	10	U	10	U
Pentachlorophenol	25	U	25	U	25	U	25	U	25	U	25	U
Phenanthrene	10	U	10	U	10	U	10	U	10	U	10	U
Phenol	10	U	10	U	10	U	10	U	10	U	10	U
Pyrene	10	U	10	U	10	U	10	U	10	U	10	U
bis(2-Chloroethoxy)methane	10	U	10	U	10	U	10	U	10	U	10	U
bis(2-Chloroethyl)ether	10	U	10	U	10	U	10	U	10	U	10	U
bis(2-Ethylhexyl)phthalate	10	U	10	U	10	U	13		10	U	10	U
n-Nitroso-di-n-propylamine	10	U	10	U	10	U	10	U	10	U	10	U
n-Nitrosodiphenylamine	10	U	10	U	10	U	10	U	10	U	10	U
Explosives (UG/L)												
1,3,5-Trinitrobenzene	0.26	U	0.26	U	0.26	U	0.26	U	0.26	U	0.26	U
1,3-Dinitrobenzene	0.26	U	0.26	U	0.26	U	0.26	U	0.26	U	0.26	U
2,4,6-Trinitrotoluene	0.26	U	0.26	U	0.26	U	0.26	U	0.26	U	0.26	U
2,4-Dinitrotoluene	0.26	U	0.26	U	0.26	U	0.26	U	0.26	U	0.26	U
2,6-Dinitrotoluene	0.26	U	0.26	U	0.26	U	0.26	U	0.26	U	0.26	U
2-Amino-4,6-dinitrotoluene	0.26	U	0.26	U	0.26	U	0.26	U	0.26	U	0.26	U
2-Nitrotoluene	0.52	U	0.52	U	0.52	U	0.52	U	0.52	U	0.52	U
3-Nitrotoluene	0.52	U	0.52	U	0.52	U	0.52	U	0.52	U	0.52	U
4-Amino-2,6-dinitrotoluene	0.26	U	0.26	U	0.26	U	0.26	U	0.26	U	0.26	U
4-Nitrotoluene	0.52	U	0.52	U	0.52	U	0.52	U	0.52	U	0.52	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
JB
U - Analyte not detected

Appendix C-4
In Situ Groundwater Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM20	IS28MM23	IS28MM27		IS28MM28	IS28MM42
Sample ID	IS28GW20-0503	IS28GW23-0503	IS28GW27-0503	IS28GW27-0503P	IS28GW28-0503	IS28GW42-0503
Sample Date	05/20/03	05/20/03	05/20/03	05/20/03	05/20/03	05/14/03
Chemical Name						
HMX	0.52 U	0.52 U	0.52 U	0.52 U	0.52 U	0.52 U
Nitrobenzene	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Nitroglycerin	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U
Nitroguanidine	10 U	10 U	10 U	10 U	10 U	10 U
PETN	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Perchlorate	4 U	4 U	4 U	4 U	4 U	4 U
RDX	0.52 U	0.52 U	0.52 U	0.52 U	0.52 U	0.52 U
Tetryl	0.52 U	0.52 U	0.52 U	0.52 U	0.52 U	0.52 U
Dissolved Metals (UG/L)						
Aluminum	45.4 B	39.7 B	50.9 B	28.8 B	168 B	27.8 B
Antimony	1.33 U	1.33 U	1.33 U	1.33 U	1.33 U	1.33 U
Arsenic	213	19.7	2.5 B	1.8 U	1.9 B	10.4
Barium	55.2 B	77.9 B	35 B	37 B	54.6 B	486
Beryllium	0.31 U	0.31 U	0.31 U	0.31 U	0.54 B	0.31 U
Cadmium	3.66 U	5.2	3.66 U	3.66 U	3.66 U	3.66 U
Calcium	7,220	3,600 B	1,240 B	1,290 B	2,510 B	21,200
Chromium	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U
Cobalt	8.3 B	8.1 B	5.2 B	5.1 B	6.4 B	10.9 B
Copper	2.38 U	2.38 U	2.9 B	2.38 U	5.9 B	2.38 U
Iron	32,200	12,700	57.3 B	37.4 B	65.7 B	7,490
Lead	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	3.4
Magnesium	4,180 B	1,050 B	982 B	997 B	2,380 B	5,190
Manganese	271	542	59.8	56.4	84.7	501
Mercury	0.03 U	0.06 B	0.11 B	0.03 U	0.03 U	0.03 B
Nickel	11.7 U	11.7 U	11.7 U	11.7 U	11.7 U	31.6 B
Potassium	2,460 B	1,760 B	1,650 B	1,800 B	763 B	2,100 B
Selenium	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U	2.1 U
Silver	4.78 U	4.78 U	4.78 U	4.78 U	4.78 U	0.57 U
Sodium	15,300	14,900	14,500	14,600	13,400	14,600
Thallium	7.2 B	4.2 B	4.8 B	5 B	4 B	5.1 B
Vanadium	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U	4.7 U
Zinc	216	14,100	116	102	667	10,900
Wet Chemistry (MG/L)						
Dissolved organic carbon	5.8	1 U	1 U	1 U	2	NA
Total organic carbon (TOC)	NA	NA	NA	NA	NA	5.6

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
JB
U - Analyte not detected

Appendix C-5

Appendix C-5
Monitoring Well Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MW01		IS28MW02	IS28MW03	IS28MW04	IS28MW05 (Upgradient Background)
Sample ID	IS28MW010903	IS28MW010903P	IS28MW020903	IS28MW030903	IS28MW040903	IS28MW050903
Sample Date	09/09/03	09/09/03	09/09/03	09/10/03	09/09/03	09/10/03
Chemical Name						
Volatile Organic Compounds (UG/L)						
1,1,1-Trichloroethane	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-Trichloroethane	10 U	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethane	10 U	10 U	10 U	10 U	10 U	10 U
1,1-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U
1,2,4-Trichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dibromo-3-chloropropane	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dibromoethane	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethane	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloroethene (total)	10 U	10 U	10 U	10 U	10 U	10 U
1,2-Dichloropropane	10 U	10 U	10 U	10 U	10 U	10 U
1,3-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U
1,4-Dichlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U
2-Butanone	10 U	10 U	10 U	10 U	10 U	10 U
2-Hexanone	10 U	10 U	10 U	10 U	10 U	10 U
4-Methyl-2-pentanone	10 U	10 U	10 U	10 U	10 U	10 U
Acetone	10 U	10 U	1 B	10 U	10 U	10 U
Benzene	10 U	10 U	10 U	10 U	10 U	10 U
Bromodichloromethane	10 U	10 U	10 U	10 U	10 U	10 U
Bromoform	10 U	10 U	10 U	10 U	10 U	10 U
Bromomethane	10 U	10 U	10 U	10 U	10 U	10 U
Carbon disulfide	10 U	10 U	10 U	10 U	10 U	10 U
Carbon tetrachloride	10 U	10 U	10 U	10 U	10 U	1 K
Chlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U
Chloroethane	10 U	10 U	10 U	10 U	10 U	10 U
Chloroform	10 U	10 U	10 U	10 U	10 U	10 U
Chloromethane	10 U	10 U	10 U	10 U	10 U	10 U
Cumene	10 U	10 U	10 U	10 U	10 U	10 U
Cyclohexane	10 U	10 U	10 U	10 U	10 U	10 U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high
U - Analyte not detected
UJ - Not detected, quantitation limit may be inaccurate
UL

Appendix C-5
Monitoring Well Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MW01		IS28MW02	IS28MW03	IS28MW04	IS28MW05 (Upgradient Background)
Sample ID	IS28MW010903	IS28MW010903P	IS28MW020903	IS28MW030903	IS28MW040903	IS28MW050903
Sample Date	09/09/03	09/09/03	09/09/03	09/10/03	09/09/03	09/10/03
Chemical Name						
Dibromochloromethane	10 U	10 U	10 U	10 U	10 U	10 U
Dichlorodifluoromethane(Freon-12)	10 U	10 U	10 U	10 U	10 U	10 U
Ethylbenzene	10 U	10 U	10 U	10 U	10 U	10 U
Methyl acetate	10 U	10 U	10 U	10 U	10 U	10 U
Methyl-tert-butyl ether (MTBE)	10 U	10 U	10 U	10 U	10 U	10 U
Methylcyclohexane	10 U	10 U	10 U	10 U	10 U	10 U
Methylene chloride	10 U	10 U	10 U	10 U	10 U	10 U
Styrene	10 U	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene	10 U	10 U	10 U	10 U	10 U	10 U
Toluene	10 U	10 U	2 J	10 U	10 U	10 U
Trichloroethene	10 U	10 U	10 U	10 U	10 U	10 U
Trichlorofluoromethane(Freon-11)	10 U	10 U	10 U	10 U	10 U	10 U
Vinyl chloride	10 U	10 U	10 U	10 U	10 U	10 U
Xylene, total	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U
m- and p-Xylene	10 U	10 U	10 U	10 U	10 U	10 U
o-Xylene	10 U	10 U	10 U	10 U	10 U	10 U
trans-1,2-Dichloroethene	10 U	10 U	10 U	10 U	10 U	10 U
trans-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U
Semi-volatile Organic Compounds (UG/L)						
1,1-Biphenyl	10 U	10 U	10 U	10 U	10 U	10 U
2,4,5-Trichlorophenol	25 U	25 U	25 U	25 U	25 U	25 U
2,4,6-Trichlorophenol	10 U	10 U	10 U	10 U	10 U	10 U
2,4-Dichlorophenol	10 U	10 U	10 U	10 U	10 U	10 U
2,4-Dimethylphenol	10 U	10 U	10 U	10 U	10 U	10 U
2,4-Dinitrophenol	25 U	25 U	25 U	25 U	25 U	25 U
2,4-Dinitrotoluene	10 U	10 U	10 U	10 U	10 U	10 U
2,6-Dinitrotoluene	10 U	10 U	10 U	10 U	10 U	10 U
2-Chloronaphthalene	10 U	10 U	10 U	10 U	10 U	10 U
2-Chlorophenol	10 U	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene	10 U	10 U	10 U	10 U	10 U	10 U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
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U - Analyte not detected
UJ - Not detected, quantitation limit may be inaccurate
UL

Appendix C-5
Monitoring Well Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MW01		IS28MW02	IS28MW03	IS28MW04	IS28MW05 (Upgradient Background)
Sample ID	IS28MW010903	IS28MW010903P	IS28MW020903	IS28MW030903	IS28MW040903	IS28MW050903
Sample Date	09/09/03	09/09/03	09/09/03	09/10/03	09/09/03	09/10/03
Chemical Name						
2-Methylphenol	10 U	10 U	10 U	10 U	10 U	10 U
2-Nitroaniline	25 U	25 U	25 U	25 U	25 U	25 U
2-Nitrophenol	10 U	10 U	10 U	10 U	10 U	10 U
3,3'-Dichlorobenzidine	10 U	10 U	10 U	10 U	10 U	10 U
3-Nitroaniline	25 U	25 U	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25 U	25 U	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10 U	10 U	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10 U	10 U	10 U	10 U	10 U	10 U
4-Chloroaniline	10 U	10 U	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10 U	10 U	10 U	10 U	10 U	10 U
4-Methylphenol	10 U	10 U	0.6 J	10 U	10 U	10 U
4-Nitroaniline	25 U	25 U	25 U	25 U	25 U	25 U
4-Nitrophenol	25 U	25 U	25 U	25 U	25 U	25 U
Acenaphthene	10 U	10 U	10 U	10 U	10 U	10 U
Acenaphthylene	10 U	10 U	10 U	10 U	10 U	10 U
Acetophenone	0.8 B	0.8 B	10 U	10 U	0.4 B	10 U
Anthracene	10 U	10 U	10 U	10 U	10 U	10 U
Atrazine	10 U	10 U	10 U	10 U	10 U	10 U
Benzaldehyde	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10 U	10 U	10 U	10 U	10 U	10 U
Bis(2-chloro-1-methylethyl) ether	10 U	10 U	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10 U	10 U	10 U	10 U	10 U	10 U
Caprolactam	10 U	10 U	9 J	3 J	10 U	90
Carbazole	10 U	10 U	10 U	10 U	10 U	10 U
Chrysene	10 U	10 U	10 U	10 U	10 U	10 U
Di-n-butylphthalate	0.6 B	0.3 B	0.3 B	0.4 B	10 U	0.6 B
Di-n-octylphthalate	10 U	10 U	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10 U	10 U	10 U	10 U	10 U	10 U
Dibenzofuran	10 U	10 U	10 U	10 U	10 U	10 U

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UL

Appendix C-5
Monitoring Well Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MW01		IS28MW02	IS28MW03	IS28MW04	IS28MW05 (Upgradient Background)
Sample ID	IS28MW010903	IS28MW010903P	IS28MW020903	IS28MW030903	IS28MW040903	IS28MW050903
Sample Date	09/09/03	09/09/03	09/09/03	09/10/03	09/09/03	09/10/03
Chemical Name						
Diethylphthalate	10 U	0.3 B	0.3 B	0.4 B	10 U	0.3 B
Dimethyl phthalate	10 U	10 U	10 U	10 U	10 U	10 U
Fluoranthene	10 U	10 U	10 U	10 U	10 U	10 U
Fluorene	10 U	10 U	10 U	10 U	10 U	10 U
Hexachlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10 U	10 U	10 U	10 U	10 U	10 U
Hexachlorocyclopentadiene	10 U	10 U	10 U	10 U	10 U	10 U
Hexachloroethane	10 U	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	10 U	10 U	10 U	10 U	10 U	10 U
Isophorone	10 U	10 U	10 U	10 U	10 U	10 U
Naphthalene	10 U	10 U	10 U	10 U	10 U	10 U
Nitrobenzene	10 U	10 U	10 U	10 U	10 U	10 U
Pentachlorophenol	25 U	25 U	25 U	25 U	25 U	25 U
Phenanthrene	10 U	10 U	10 U	10 U	10 U	10 U
Phenol	46 B	53 B	2 B	20 B	31 B	10 U
Pyrene	10 U	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethoxy)methane	10 U	10 U	10 U	10 U	10 U	10 U
bis(2-Chloroethyl)ether	10 U	10 U	10 U	10 U	10 U	10 U
bis(2-Ethylhexyl)phthalate	250 J	290 J	2 B	6 B	0.6 B	2 B
n-Nitroso-di-n-propylamine	10 U	10 U	10 U	10 U	10 U	10 U
n-Nitrosodiphenylamine	10 U	10 U	10 U	10 U	10 U	10 U
Explosives (UG/L)						
1,3,5-Trinitrobenzene	0.26 UJ	0.26 UJ	0.26 UJ	0.26 U	0.26 UJ	0.26 U
1,3-Dinitrobenzene	0.26 UJ	0.26 UJ	0.26 UJ	0.26 U	0.26 UJ	0.26 U
2,4,6-Trinitrotoluene	0.26 UJ	0.26 UJ	0.26 UJ	0.26 U	0.26 UJ	0.26 U
2,4-Dinitrotoluene	0.26 UJ	0.26 UJ	0.26 UJ	0.26 U	0.26 UJ	0.26 U
2,6-Dinitrotoluene	0.26 UJ	0.26 UJ	0.26 UJ	0.26 U	0.26 UJ	0.26 U
2-Amino-4,6-dinitrotoluene	0.26 UJ	0.26 UJ	0.26 UJ	0.26 U	0.26 UJ	0.26 U
2-Nitrotoluene	0.52 UJ	0.52 UJ	0.52 UJ	0.52 U	0.52 UJ	0.52 U
3-Nitrotoluene	0.52 UJ	0.52 UJ	0.52 UJ	0.52 U	0.52 UJ	0.52 U
4-Amino-2,6-dinitrotoluene	0.26 UJ	0.26 UJ	0.26 UJ	0.26 U	0.26 UJ	0.26 U
4-Nitrotoluene	0.52 UJ	0.52 UJ	0.52 UJ	0.52 U	0.52 UJ	0.52 U

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UL

Appendix C-5
Monitoring Well Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MW01		IS28MW02	IS28MW03	IS28MW04	IS28MW05 (Upgradient Background)
Sample ID	IS28MW010903	IS28MW010903P	IS28MW020903	IS28MW030903	IS28MW040903	IS28MW050903
Sample Date	09/09/03	09/09/03	09/09/03	09/10/03	09/09/03	09/10/03
Chemical Name						
HMX	0.52 UJ	0.52 UJ	0.52 UJ	0.52 U	0.52 UJ	0.52 U
Nitrobenzene	0.26 UJ	0.26 UJ	0.26 UJ	0.26 U	0.26 UJ	0.26 U
Nitroglycerin	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U	1,000 U
Nitroguanidine	10 U	10 U	10 U	10 U	10 U	10 U
PETN	1.3 UJ	1.3 UJ	1.3 UJ	1.3 U	1.3 UJ	1.3 U
Perchlorate	4 U	4 U	12 U	20 U	4 U	20 U
RDX	0.52 UJ	0.52 UJ	0.52 UJ	0.52 U	0.52 UJ	0.52 U
Tetryl	0.52 UJ	0.52 UJ	0.52 UJ	0.52 U	0.52 UJ	0.52 U
Total Metals (UG/L)						
Aluminum	553	692	8,590	19,300	4,520	32,800
Antimony	1.74 U	1.74 U	2.1 J	1.74 U	1.74 U	1.74 U
Arsenic	342	347	135	12.1 K	2.13 U	28
Barium	32.4 J	32.9 J	109 J	241	90.4 J	156 J
Beryllium	0.22 U	0.22 U	0.4 J	2.4 J	0.54 J	4.7 J
Cadmium	0.61 B	0.59 B	0.75 B	3.3 J	0.25 U	2.66 U
Calcium	4,620 J	4,620 J	9,330	10,600	3,120 J	2,230 J
Chromium	2.2 J	1.7 J	11.4 K	27.4	13.8 K	44.1
Cobalt	7.2 J	5.8 J	3.9 B	59.8 K	34.9 J	73.6 K
Copper	36.2 K	21.7 J	30 K	50.8	16.5 J	46.8 K
Iron	11,500	11,700	6,870	36,400	4,810	125,000
Lead	4.9 K	6.8	16.3	29.9	4.8 K	17.4
Magnesium	3,420 J	3,440 J	8,710	9,690	2,340 J	3,030 J
Manganese	434	434	143	601	281	627
Mercury	0.15 B	0.11 B	0.1 B	0.18 B	0.07 B	0.21 B
Nickel	7.4 J	6 J	8.6 J	31.6 B	12.9 J	68.5 B
Potassium	2,050 B	1,570 B	5,170	6,290	2,950 J	2,930 J
Selenium	2.32 UL	3.6 B	3.7 B	2.32 U	3 B	2.32 U
Silver	1.16 U	1.16 U	1.16 U	3.6 U	1.16 U	3.6 U
Sodium	23,000	24,600	19,400	25,000	11,500	17,400
Thallium	4.8 B	4.2 B	3.1 B	3.6 B	2.77 U	2.77 U
Vanadium	0.74 U	1.3 B	18.9 J	61.8 K	14.5 J	71.5 K
Zinc	961	969	580	1,620	100	153

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Appendix C-5
Monitoring Well Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MW01		IS28MW02	IS28MW03	IS28MW04	IS28MW05 (Upgradient Background)
Sample ID	IS28MW010903	IS28MW010903P	IS28MW020903	IS28MW030903	IS28MW040903	IS28MW050903
Sample Date	09/09/03	09/09/03	09/09/03	09/10/03	09/09/03	09/10/03
Chemical Name						
Dissolved Metals (UG/L)						
Aluminum	252	338	3,840	8,190	1,130	17,300
Antimony	1.74 U	1.74 U	3.1 J	1.74 U	1.74 U	1.74 U
Arsenic	317	292	93.5	4.2 J	2.13 U	13.7 K
Barium	31.9 J	31.6 J	107 J	182 J	68.8 J	119 J
Beryllium	0.22 U	0.22 U	0.33 J	0.88 B	0.33 J	2.5 J
Cadmium	0.4 B	0.56 B	10 K	8 K	0.25 U	10 K
Calcium	4,530 J	4,490 J	8,960	9,260	2,740 J	2,000 J
Chromium	1.5 J	0.93 J	6.1 J	12.2 K	3.4 J	23.4
Cobalt	6.6 J	6.4 J	3.6 B	41.1 J	27.3 J	50.4 K
Copper	10.3 J	7.6 B	22 J	31 K	14.8 J	36
Iron	12,900	13,200	3,870	15,100	981	65,300
Lead	2.2 J	2.2 J	7.8	12.5	1.56 U	9.1
Magnesium	3,390 J	3,320 J	8,630	7,590	1,940 J	2,280 J
Manganese	441	434	127	376	218	436
Mercury	0.16 B	0.16 B	0.11 B	0.14 B	0.13 B	0.18 B
Nickel	5.1 J	4.8 J	6.4 J	28.9 B	8.5 J	38.6 B
Potassium	1,200 B	1,390 B	4,750 J	5,370	2,460 B	2,490 J
Selenium	2.5 B	2.6 B	2.32 U	2.32 U	2.32 U	2.32 U
Silver	1.16 U	1.16 U	1.16 U	3.6 U	1.16 U	3.6 U
Sodium	20,500	19,400	20,400	25,500	11,700	17,700
Thallium	2.77 U	2.77 U	2.77 U	2.77 U	5.2 B	2.77 U
Vanadium	0.74 U	0.74 U	10.7 J	23.5 J	3.1 B	38.8 J
Zinc	886	868	320	1,230	75.1	82.8
Wet Chemistry (MG/L)						
Dissolved organic carbon	6.6	6	NA	NA	1 U	2

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UJ - Not detected, quantitation limit may be inaccurate
UL

Appendix C-6

Appendix C-6
Surface Water Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SWSD01		IS28SWSD02		IS28SWSD03			
Sample ID	IS28SW01-0503		IS28SW02-0503		IS28SW03-0503		IS28SW03-0503P	
Sample Date	05/21/03		05/21/03		05/20/03		05/20/03	
Chemical Name								
Volatile Organic Compounds (UG/L)								
1,1,1-Trichloroethane	10	U	10	U	10	U	10	U
1,1,2,2-Tetrachloroethane	10	U	10	U	10	U	10	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10	U	10	U	10	U	10	U
1,1,2-Trichloroethane	10	U	10	U	10	U	10	U
1,1-Dichloroethane	10	U	10	U	10	U	10	U
1,1-Dichloroethene	10	U	10	UL	10	U	10	U
1,2,4-Trichlorobenzene	10	U	10	U	10	U	10	U
1,2-Dibromo-3-chloropropane	10	R	10	R	10	U	10	U
1,2-Dibromoethane	10	U	10	U	10	U	10	U
1,2-Dichlorobenzene	10	U	10	U	10	U	10	U
1,2-Dichloroethane	10	U	10	U	10	U	10	U
1,2-Dichloroethene (total)	10	U	10	U	NA		NA	
1,2-Dichloropropane	10	U	10	U	10	U	10	U
1,3-Dichlorobenzene	10	U	10	U	10	U	10	U
1,4-Dichlorobenzene	10	U	10	U	10	U	10	U
2-Butanone	10	U	10	U	10	U	10	U
2-Hexanone	10	U	10	U	10	U	10	U
4-Methyl-2-pentanone	10	U	10	U	10	U	10	U
Acetone	10	U	10	U	10	U	10	U
Benzene	10	U	10	UL	10	U	10	U
Bromodichloromethane	10	U	10	U	10	U	10	U
Bromoform	10	U	10	U	10	U	10	U
Bromomethane	10	U	10	U	10	U	10	U
Carbon disulfide	10	U	10	U	10	U	10	U
Carbon tetrachloride	10	U	10	U	10	U	10	U
Chlorobenzene	10	U	10	UL	10	U	10	U
Chloroethane	10	U	10	U	10	U	10	U
Chloroform	10	U	10	U	10	U	10	U
Chloromethane	10	U	10	U	10	U	10	U
Cumene	10	U	10	U	10	U	10	U
Cyclohexane	10	U	10	U	10	U	10	U
Dibromochloromethane	10	U	10	U	10	U	10	U
Dichlorodifluoromethane(Freon-12)	10	U	10	U	10	U	10	U

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L - Reported value may be biased low

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U - Analyte not detected
UL

Appendix C-6
Surface Water Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SWSD01		IS28SWSD02		IS28SWSD03			
Sample ID	IS28SW01-0503		IS28SW02-0503		IS28SW03-0503		IS28SW03-0503P	
Sample Date	05/21/03		05/21/03		05/20/03		05/20/03	
Chemical Name								
Ethylbenzene	10	U	10	U	10	U	10	U
Methyl acetate	10	U	10	U	10	U	10	U
Methyl-tert-butyl ether (MTBE)	10	U	10	U	10	U	10	U
Methylcyclohexane	10	U	10	U	10	U	10	U
Methylene chloride	10	U	10	U	10	U	10	U
Styrene	10	U	10	U	10	U	10	U
Tetrachloroethene	10	U	10	U	10	U	10	U
Toluene	10	U	10	UL	10	U	10	U
Trichloroethene	10	U	10	UL	10	U	10	U
Trichlorofluoromethane(Freon-11)	10	U	10	U	10	U	10	U
Vinyl chloride	10	U	10	U	10	U	10	U
Xylene, total	10	U	10	U	10	U	10	U
cis-1,2-Dichloroethene	10	U	10	U	10	U	10	U
cis-1,3-Dichloropropene	10	U	10	U	10	U	10	U
m- and p-Xylene	10	U	10	U	NA		NA	
o-Xylene	10	U	10	U	NA		NA	
trans-1,2-Dichloroethene	10	U	10	U	10	U	10	U
trans-1,3-Dichloropropene	10	U	10	U	10	U	10	U
Semi-volatile Organic Compounds (UG/L)								
1,1-Biphenyl	10	U	10	U	10	U	10	U
2,4,5-Trichlorophenol	25	U	25	U	25	U	25	U
2,4,6-Trichlorophenol	10	U	10	U	10	U	10	U
2,4-Dichlorophenol	10	U	10	U	10	U	10	U
2,4-Dimethylphenol	10	U	10	U	10	U	10	U
2,4-Dinitrophenol	25	U	25	U	25	U	25	U
2,4-Dinitrotoluene	10	U	10	U	10	U	10	U
2,6-Dinitrotoluene	10	U	10	U	10	U	10	U
2-Chloronaphthalene	10	U	10	U	10	U	10	U
2-Chlorophenol	10	U	10	U	10	U	10	U
2-Methylnaphthalene	10	U	10	U	10	U	10	U
2-Methylphenol	10	U	10	U	10	U	10	U
2-Nitroaniline	25	U	25	U	25	U	25	U
2-Nitrophenol	10	U	10	U	10	U	10	U
3,3'-Dichlorobenzidine	10	U	10	U	10	U	10	U

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UL

Appendix C-6
Surface Water Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SWSD01	IS28SWSD02	IS28SWSD03	
Sample ID	IS28SW01-0503	IS28SW02-0503	IS28SW03-0503	IS28SW03-0503P
Sample Date	05/21/03	05/21/03	05/20/03	05/20/03
Chemical Name				
3-Nitroaniline	25 U	25 U	25 U	25 U
4,6-Dinitro-2-methylphenol	25 U	25 U	25 U	25 U
4-Bromophenyl-phenylether	10 U	10 U	10 U	10 U
4-Chloro-3-methylphenol	10 U	10 U	10 U	10 U
4-Chloroaniline	10 U	10 U	10 U	10 U
4-Chlorophenyl-phenylether	10 U	10 U	10 U	10 U
4-Methylphenol	10 U	10 U	10 U	10 U
4-Nitroaniline	25 U	25 U	25 U	25 U
4-Nitrophenol	25 U	25 U	25 U	25 U
Acenaphthene	10 U	10 U	10 U	10 U
Acenaphthylene	10 U	10 U	10 U	10 U
Acetophenone	10 U	10 U	10 U	10 U
Anthracene	10 U	10 U	10 U	10 U
Atrazine	10 U	10 U	10 U	10 U
Benzaldehyde	10 U	10 U	10 U	10 U
Benzo(a)anthracene	10 U	10 U	10 U	10 U
Benzo(a)pyrene	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene	10 U	10 U	10 U	10 U
Benzo(g,h,i)perylene	10 U	10 U	10 U	10 U
Benzo(k)fluoranthene	10 U	10 U	10 U	10 U
Bis(2-chloro-1-methylethyl) ether	10 U	10 U	10 U	10 U
Butylbenzylphthalate	10 U	10 U	10 U	10 U
Caprolactam	10 U	10 U	10 U	10 U
Carbazole	10 U	10 U	10 U	10 U
Chrysene	10 U	10 U	10 U	10 U
Di-n-butylphthalate	10 U	10 U	10 U	10 U
Di-n-octylphthalate	10 U	10 U	10 U	10 U
Dibenz(a,h)anthracene	10 U	10 U	10 U	10 U
Dibenzofuran	10 U	10 U	10 U	10 U
Diethylphthalate	10 U	10 U	10 U	10 U
Dimethyl phthalate	10 U	10 U	10 U	10 U
Fluoranthene	10 U	10 U	10 U	10 U
Fluorene	10 U	10 U	10 U	10 U
Hexachlorobenzene	10 U	10 U	10 U	10 U
Hexachlorobutadiene	10 U	10 U	10 U	10 U

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Appendix C-6
Surface Water Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SWSD01		IS28SWSD02		IS28SWSD03			
Sample ID	IS28SW01-0503		IS28SW02-0503		IS28SW03-0503		IS28SW03-0503P	
Sample Date	05/21/03		05/21/03		05/20/03		05/20/03	
Chemical Name								
Hexachlorocyclopentadiene	10	U	10	U	10	U	10	U
Hexachloroethane	10	U	10	U	10	U	10	U
Indeno(1,2,3-cd)pyrene	10	U	10	U	10	U	10	U
Isophorone	10	U	10	U	10	U	10	U
Naphthalene	10	U	10	U	10	U	10	U
Nitrobenzene	10	U	10	U	10	U	10	U
Pentachlorophenol	25	U	25	U	25	U	25	U
Phenanthrene	10	U	10	U	10	U	10	U
Phenol	10	U	10	U	10	U	10	U
Pyrene	10	U	10	U	10	U	10	U
bis(2-Chloroethoxy)methane	10	U	10	U	10	U	10	U
bis(2-Chloroethyl)ether	10	U	10	U	10	U	10	U
bis(2-Ethylhexyl)phthalate	10	U	10	U	10	U	10	U
n-Nitroso-di-n-propylamine	10	U	10	U	10	U	10	U
n-Nitrosodiphenylamine	10	U	10	U	10	U	10	U
Explosives (UG/L)								
1,3,5-Trinitrobenzene	0.26	UL	0.26	UL	0.26	U	0.26	UL
1,3-Dinitrobenzene	0.26	UL	0.26	UL	0.26	U	0.26	UL
2,4,6-Trinitrotoluene	0.26	UL	0.26	UL	0.26	U	0.26	UL
2,4-Dinitrotoluene	0.26	UL	0.26	UL	0.26	U	0.26	UL
2,6-Dinitrotoluene	0.26	UL	0.26	UL	0.26	U	0.26	UL
2-Amino-4,6-dinitrotoluene	0.26	UL	0.26	UL	0.26	U	0.26	UL
2-Nitrotoluene	0.52	UL	0.52	UL	0.52	U	0.52	UL
3-Nitrotoluene	0.52	UL	0.52	UL	0.52	U	0.52	UL
4-Amino-2,6-dinitrotoluene	0.26	UL	0.26	UL	0.26	U	0.26	UL
4-Nitrotoluene	0.52	UL	0.52	UL	0.52	U	0.52	UL
HMX	0.52	UL	0.52	UL	0.52	U	0.52	UL
Nitrobenzene	0.26	UL	0.15	L	0.26	U	0.26	UL
Nitroglycerin	1,000	U	1,000	U	1,000	U	1,000	UL
Nitroguanidine	10	U	10	U	10	U	10	UL
PETN	1.3	U	1.3	U	1.3	U	1.3	UL
Perchlorate	4	U	4	U	4	U	4	U
RDX	0.52	UL	0.52	UL	0.52	U	0.52	UL
Tetryl	0.52	UL	0.52	UL	0.52	U	0.52	UL

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L - Reported value may be biased low

R - Unreliable result
U - Analyte not detected
UL

Appendix C-6
Surface Water Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SWSD01		IS28SWSD02		IS28SWSD03			
Sample ID	IS28SW01-0503		IS28SW02-0503		IS28SW03-0503		IS28SW03-0503P	
Sample Date	05/21/03		05/21/03		05/20/03		05/20/03	
Chemical Name								
Total Metals (UG/L)								
Aluminum	20.2	U	199	B	46.3	B	44.6	B
Antimony	1.33	U	1.33	U	1.33	U	1.33	U
Arsenic	1.8	U	3.8	J	6.7	B	7	B
Barium	67.4	J	49.9	J	35	J	35.1	J
Beryllium	0.31	U	0.31	U	0.31	U	0.31	U
Cadmium	6.3	K	7.3	K	5.3	K	7.6	K
Calcium	6,340		4,360	J	2,900	J	2,880	J
Chromium	0.57	U	0.57	U	0.57	U	0.57	U
Cobalt	0.63	J	2.2	J	1.5	B	2.2	B
Copper	2.38	U	24.3	B	15.9	J	16.6	J
Iron	63.6	B	6,600		173	J	194	J
Lead	0.91	U	61.5		5.9	B	6.9	B
Magnesium	1,820	J	1,290	J	736	J	717	J
Manganese	10.5	J	45.8		27.1	K	27	K
Mercury	0.12	B	0.09	B	0.06	B	0.04	B
Nickel	10.4	J	5.4	J	11.7	U	11.7	U
Potassium	1,240	B	1,510	B	1,320	J	1,320	J
Selenium	2.1	U	2.1	U	2.1	U	2.1	U
Silver	4.78	U	4.78	U	4.78	U	4.78	U
Sodium	21,700		17,800		11,900		11,700	
Thallium	5.4	B	5.8	B	3.1	B	5.5	B
Vanadium	4.7	U	4.7	U	4.7	U	4.7	U
Zinc	3,900		4,140		2,830		2,890	
Dissolved Metals (UG/L)								
Aluminum	20.2	U	20.2	U	19.7	B	44.4	B
Antimony	1.33	U	1.33	U	1.33	U	1.33	U
Arsenic	1.8	U	1.8	U	7	B	5.6	B
Barium	63.8	J	50.5	J	35	J	37.2	J
Beryllium	0.31	U	0.31	U	0.31	U	0.31	U
Cadmium	6.1	K	7.4	K	5.6	K	4.7	J
Calcium	6,240		4,420	J	3,010	J	3,210	J
Chromium	0.57	U	0.57	U	0.57	U	0.57	U

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UL

Appendix C-6
Surface Water Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28SWSD01	IS28SWSD02	IS28SWSD03	
Sample ID	IS28SW01-0503	IS28SW02-0503	IS28SW03-0503	IS28SW03-0503P
Sample Date	05/21/03	05/21/03	05/20/03	05/20/03
Chemical Name				
Cobalt	0.83 J	2.3 J	1.4 B	1.5 B
Copper	2.38 U	2.38 U	7.5 B	9.1 B
Iron	8.8 B	678	83.9 J	80.6 J
Lead	0.91 U	0.99 B	1.6 B	2.3 B
Magnesium	1,780 J	1,300 J	715 J	733 J
Manganese	8.4 J	44.2	27.3 K	28.4 K
Mercury	0.09 B	0.03 UL	0.1 B	0.09 B
Nickel	4 J	4.5 J	11.7 U	11.7 U
Potassium	1,440 B	1,010 B	1,150 J	1,130 J
Selenium	2.1 U	2.1 U	2.1 U	2.1 U
Silver	4.78 U	4.78 U	4.78 U	4.78 U
Sodium	21,100	19,200	12,900	13,700
Thallium	8.2 B	3.6 B	6.1 B	7.4 B
Vanadium	4.7 U	4.7 U	4.7 U	4.7 U
Zinc	3,760	4,420	2,790	2,880
Wet Chemistry (MG/L)				
Dissolved organic carbon	1	12	2	2

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Appendix C-7

Appendix C-7
Background Surface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM01		IS28MM16		IS28SO34		IS28SO39	
Sample ID	IS28SS01-0001		IS28SS16-0001		IS28SS34-0001		IS28SS39-0001	
Sample Date	05/15/03		05/14/03		05/16/03		05/16/03	
Chemical Name								
Volatile Organic Compounds (UG/KG)								
1,1,1-Trichloroethane	12	U	12	U	12	U	17	U
1,1,2,2-Tetrachloroethane	12	U	12	U	12	U	17	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	12	U	12	U	12	U	17	U
1,1,2-Trichloroethane	12	U	12	U	12	U	17	U
1,1-Dichloroethane	12	U	12	U	12	U	17	U
1,1-Dichloroethene	12	U	12	U	12	U	17	U
1,2,4-Trichlorobenzene	12	U	12	U	12	U	17	U
1,2-Dibromo-3-chloropropane	12	U	12	U	12	U	17	U
1,2-Dibromoethane	12	U	12	U	12	U	17	U
1,2-Dichlorobenzene	12	U	12	U	12	U	17	U
1,2-Dichloroethane	12	U	12	U	12	U	17	U
1,2-Dichloropropane	12	U	12	U	12	U	17	U
1,3-Dichlorobenzene	12	U	12	U	12	U	17	U
1,4-Dichlorobenzene	12	U	12	U	12	U	17	U
2-Butanone	12	U	12	U	12	U	17	U
2-Hexanone	12	U	12	U	12	U	17	U
4-Methyl-2-pentanone	12	U	12	U	12	U	17	U
Acetone	12	U	12	U	12	U	27	B
Benzene	12	U	12	U	12	U	17	U
Bromodichloromethane	12	U	12	U	12	U	17	U
Bromoform	12	U	12	U	12	U	17	U
Bromomethane	12	U	12	U	12	U	17	U
Carbon disulfide	12	U	12	U	12	U	17	U
Carbon tetrachloride	12	U	12	U	12	U	17	U
Chlorobenzene	12	U	12	U	12	U	17	U
Chloroethane	12	U	12	U	12	U	17	U
Chloroform	12	U	12	U	12	U	17	U
Chloromethane	12	U	12	U	12	U	17	U
Cumene	12	U	12	U	12	U	17	U
Cyclohexane	12	U	12	U	12	U	17	U
Dibromochloromethane	12	U	12	U	12	U	17	U
Dichlorodifluoromethane(Freon-12)	12	U	12	U	12	U	17	U
Ethylbenzene	12	U	12	U	12	U	17	U

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Appendix C-7
Background Surface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM01		IS28MM16		IS28SO34		IS28SO39	
Sample ID	IS28SS01-0001		IS28SS16-0001		IS28SS34-0001		IS28SS39-0001	
Sample Date	05/15/03		05/14/03		05/16/03		05/16/03	
Chemical Name								
Methyl acetate	12	U	12	U	12	U	17	U
Methyl-tert-butyl ether (MTBE)	12	U	12	U	12	U	17	U
Methylcyclohexane	12	U	12	U	12	U	17	U
Methylene chloride	12	U	12	U	12	U	17	U
Styrene	12	U	12	U	12	U	17	U
Tetrachloroethene	12	U	12	U	12	U	17	U
Toluene	12	U	12	U	12	U	17	U
Trichloroethene	12	U	12	U	12	U	17	U
Trichlorofluoromethane(Freon-11)	12	U	12	U	12	U	17	U
Vinyl chloride	12	U	12	U	12	U	17	U
Xylene, total	12	U	12	U	12	U	17	U
cis-1,2-Dichloroethene	12	U	12	U	12	U	17	U
cis-1,3-Dichloropropene	12	U	12	U	12	U	17	U
trans-1,2-Dichloroethene	12	U	12	U	12	U	17	U
trans-1,3-Dichloropropene	12	U	12	U	12	U	17	U
Semi-volatile Organic Compounds (UG/KG)								
1,1-Biphenyl	460	U	380	U	390	U	600	U
2,4,5-Trichlorophenol	1,200	U	950	U	980	U	1,500	U
2,4,6-Trichlorophenol	460	U	380	U	390	U	600	U
2,4-Dichlorophenol	460	U	380	U	390	U	600	U
2,4-Dimethylphenol	460	U	380	U	390	U	600	U
2,4-Dinitrophenol	1,200	U	950	U	980	U	1,500	U
2,4-Dinitrotoluene	460	U	380	U	390	U	600	U
2,6-Dinitrotoluene	460	U	380	U	390	U	600	U
2-Chloronaphthalene	460	U	380	U	390	U	600	U
2-Chlorophenol	460	U	380	U	390	U	600	U
2-Methylnaphthalene	460	U	380	U	390	U	600	U
2-Methylphenol	460	U	380	U	390	U	600	U
2-Nitroaniline	1,200	U	950	U	980	U	1,500	U
2-Nitrophenol	460	U	380	U	390	U	600	U
3,3'-Dichlorobenzidine	460	U	380	U	390	U	600	U
3-Nitroaniline	1,200	U	950	U	980	U	1,500	U
4,6-Dinitro-2-methylphenol	1,200	U	950	U	980	U	1,500	U
4-Bromophenyl-phenylether	460	U	380	U	390	U	600	U

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UL

Appendix C-7
Background Surface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM01	IS28MM16	IS28SO34	IS28SO39
Sample ID	IS28SS01-0001	IS28SS16-0001	IS28SS34-0001	IS28SS39-0001
Sample Date	05/15/03	05/14/03	05/16/03	05/16/03
Chemical Name				
4-Chloro-3-methylphenol	460 U	380 U	390 U	600 U
4-Chloroaniline	460 U	380 U	390 U	600 U
4-Chlorophenyl-phenylether	460 U	380 U	390 U	600 U
4-Methylphenol	460 U	380 U	390 U	600 U
4-Nitroaniline	1,200 U	950 U	980 U	1,500 U
4-Nitrophenol	1,200 U	950 U	980 U	1,500 U
Acenaphthene	460 U	380 U	390 U	600 U
Acenaphthylene	460 U	380 U	140 J	160 J
Acetophenone	460 U	380 U	390 U	600 U
Anthracene	460 U	36 J	200 J	160 J
Atrazine	460 U	380 U	390 U	600 U
Benzaldehyde	460 U	380 U	390 U	54 J
Benzo(a)anthracene	85 J	170 J	1,100	1,100
Benzo(a)pyrene	80 J	160 J	650	860
Benzo(b)fluoranthene	140 J	330 J	1,900	1,700
Benzo(g,h,i)perylene	62 J	170 J	94 J	150 J
Benzo(k)fluoranthene	66 J	130 J	770	640
Bis(2-chloro-1-methylethyl) ether	460 U	380 U	390 U	600 U
Butylbenzylphthalate	390 J	380 U	390 U	600 U
Caprolactam	460 U	380 U	390 U	600 U
Carbazole	460 U	380 U	25 J	600 U
Chrysene	120 J	210 J	1,300	1,400
Di-n-butylphthalate	270 B	63 B	390 U	88 B
Di-n-octylphthalate	460 U	380 U	390 U	600 U
Dibenz(a,h)anthracene	460 U	81 J	200 J	170 J
Dibenzofuran	460 U	380 U	390 U	600 U
Diethylphthalate	33 J	380 U	390 U	600 U
Dimethyl phthalate	460 U	380 U	390 U	600 U
Fluoranthene	130 J	230 J	1,100	1,200
Fluorene	460 U	380 U	390 U	600 U
Hexachlorobenzene	460 U	380 U	390 U	600 U
Hexachlorobutadiene	460 U	380 U	390 U	600 U
Hexachlorocyclopentadiene	460 U	380 U	390 U	600 U
Hexachloroethane	460 U	380 U	390 U	600 U
Indeno(1,2,3-cd)pyrene	77 J	200 J	610	610

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Appendix C-7
Background Surface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM01	IS28MM16	IS28SO34	IS28SO39
Sample ID	IS28SS01-0001	IS28SS16-0001	IS28SS34-0001	IS28SS39-0001
Sample Date	05/15/03	05/14/03	05/16/03	05/16/03
Chemical Name				
Isophorone	460 U	380 U	390 U	600 U
Naphthalene	460 U	380 U	390 U	600 U
Nitrobenzene	460 U	380 U	390 U	600 U
Pentachlorophenol	1,200 U	950 U	980 U	1,500 U
Phenanthrene	27 J	58 J	82 J	200 J
Phenol	460 U	380 U	390 U	600 U
Pyrene	130 J	260 J	1,300	1,200
bis(2-Chloroethoxy)methane	460 U	380 U	390 U	600 U
bis(2-Chloroethyl)ether	460 U	380 U	390 U	600 U
bis(2-Ethylhexyl)phthalate	430 J	55 J	390 U	600 U
n-Nitroso-di-n-propylamine	460 U	380 U	390 U	600 U
n-Nitrosodiphenylamine	460 U	29 J	390 U	600 U
Explosives (UG/KG)				
1,3,5-Trinitrobenzene	100 U	100 U	100 U	100 U
1,3-Dinitrobenzene	100 UL	100 U	100 UL	100 UL
2,4,6-Trinitrotoluene	100 UL	150 L	100 UL	100 UL
2,4-Dinitrotoluene	100 U	100 U	100 U	100 U
2,6-Dinitrotoluene	100 U	100 U	100 U	100 U
2-Amino-4,6-dinitrotoluene	100 U	100 U	100 U	100 U
2-Nitrotoluene	200 UL	200 U	200 UL	200 UL
3-Nitrotoluene	200 U	200 U	200 U	200 U
4-Amino-2,6-dinitrotoluene	100 U	100 U	100 U	100 U
4-Nitrotoluene	200 U	200 U	200 U	200 U
HMX	200 UL	200 U	200 UL	200 UL
Nitrobenzene	100 UL	37 L	100 UL	100 UL
Nitroglycerin	5,800 U	5,800 U	6,300 U	8,500 U
Nitroguanidine	130 U	130 U	130 U	130 U
PETN	500 U	500 U	500 U	500 U
Perchlorate	41 U	40 U	40 U	40 U
RDX	200 UL	200 U	200 UL	200 UL
Tetryl	200 U	200 U	200 U	200 U
Total Metals (MG/KG)				
Aluminum	5,780	6,570	1,760	4,260

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UL

Appendix C-7
Background Surface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM01	IS28MM16	IS28SO34	IS28SO39
Sample ID	IS28SS01-0001	IS28SS16-0001	IS28SS34-0001	IS28SS39-0001
Sample Date	05/15/03	05/14/03	05/16/03	05/16/03
Chemical Name				
Antimony	0.3 U	0.21 R	0.23 U	0.83 B
Arsenic	17.3	50.6 L	24.8	139
Barium	41.4 J	98.4	12.9 J	66.4
Beryllium	0.23 B	0.23 B	0.12 B	1 B
Cadmium	1.2 K	2.8 B	0.63 U	1.6 K
Calcium	1,430	1,560	421 J	651 J
Chromium	11.2	13.5	5.4	8.8
Cobalt	3.1 J	4.9 J	1.4 B	12.4 J
Copper	11.5	25.9	4.4 B	50
Iron	12,500	15,200	5,430	17,400
Lead	21.6	251	10.7	37.3
Magnesium	786 J	2,150	168 J	589 J
Manganese	176	151	139	131
Mercury	0.05 B	0.18 B	0.2	0.16 B
Nickel	10.5 B	29.2	5.6 B	20.5 B
Potassium	353 B	446 J	88.3 U	346 B
Selenium	0.52 B	0.46 J	0.36 U	0.61 U
Silver	1.07 U	1.2 J	0.82 U	1.4 U
Sodium	92.5 B	38.1 B	18.9 B	145 B
Thallium	0.67 U	0.47 U	0.51 U	0.87 U
Vanadium	18.6 K	42	6.8 J	21.8 K
Zinc	151	1,420	36.7	499
Wet Chemistry (MG/KG)				
% Solids	86	87	79	59
Total organic carbon (TOC)	32,000	28,000	15,000	43,000
pH	5.9	6.6	6.1	5.6

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UL

Appendix C-8

Appendix C-8
Background Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM01		IS28MM16		IS28SO34		IS28SO39			
Sample ID	IS28SB01-0103		IS28SB16-0103		IS28SB34-0103		IS28SB39-0103		IS28SB39-0103P	
Sample Date	05/15/03		05/14/03		05/16/03		05/16/03		05/16/03	
Chemical Name										
Volatile Organic Compounds (UG/KG)										
1,1,1-Trichloroethane	12	U	12	U	13	U	13	U	13	U
1,1,2,2-Tetrachloroethane	12	U	12	U	13	U	13	U	13	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	12	U	12	U	13	U	13	U	13	U
1,1,2-Trichloroethane	12	U	12	U	13	U	13	U	13	U
1,1-Dichloroethane	12	U	12	U	13	U	13	U	13	U
1,1-Dichloroethene	12	U	12	U	13	U	13	U	13	U
1,2,4-Trichlorobenzene	12	U	12	U	13	U	13	U	13	U
1,2-Dibromo-3-chloropropane	12	U	12	U	13	U	13	U	13	U
1,2-Dibromoethane	12	U	12	U	13	U	13	U	13	U
1,2-Dichlorobenzene	12	U	12	U	13	U	13	U	13	U
1,2-Dichloroethane	12	U	12	U	13	U	13	U	13	U
1,2-Dichloropropane	12	U	12	U	13	U	13	U	13	U
1,3-Dichlorobenzene	12	U	12	U	13	U	13	U	13	U
1,4-Dichlorobenzene	12	U	12	U	13	U	13	U	13	U
2-Butanone	12	U	12	U	13	U	13	U	13	U
2-Hexanone	12	U	12	U	13	U	13	U	13	U
4-Methyl-2-pentanone	12	U	12	U	13	U	13	U	13	U
Acetone	12	U	12	U	13	U	17	B	29	B
Benzene	12	U	12	U	13	U	13	U	13	U
Bromodichloromethane	12	U	12	U	13	U	13	U	13	U
Bromoform	12	U	12	U	13	U	13	U	13	U
Bromomethane	12	U	12	U	13	U	13	U	13	U
Carbon disulfide	12	U	12	U	13	U	13	U	13	U
Carbon tetrachloride	12	U	12	U	13	U	13	U	13	U
Chlorobenzene	12	U	12	U	13	U	13	U	13	U
Chloroethane	12	U	12	U	13	U	13	U	13	U
Chloroform	12	U	12	U	13	U	13	U	13	U
Chloromethane	12	U	12	U	13	U	13	U	13	U
Cumene	12	U	12	U	13	U	13	U	13	U
Cyclohexane	12	U	12	U	13	U	13	U	13	U
Dibromochloromethane	12	U	12	U	13	U	13	U	13	U
Dichlorodifluoromethane(Freon-12)	12	U	12	U	13	U	13	U	13	U
Ethylbenzene	12	U	12	U	13	U	13	U	13	U

NA - Not analyzed
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UL

Appendix C-8
Background Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM01		IS28MM16		IS28SO34		IS28SO39		IS28SO39	
Sample ID	IS28SB01-0103		IS28SB16-0103		IS28SB34-0103		IS28SB39-0103		IS28SB39-0103P	
Sample Date	05/15/03		05/14/03		05/16/03		05/16/03		05/16/03	
Chemical Name										
Methyl acetate	12	U	12	U	13	U	13	U	13	U
Methyl-tert-butyl ether (MTBE)	12	U	12	U	13	U	13	U	13	U
Methylcyclohexane	12	U	12	U	13	U	13	U	13	U
Methylene chloride	12	U	12	U	13	U	13	U	13	U
Styrene	12	U	12	U	13	U	13	U	13	U
Tetrachloroethene	12	U	12	U	13	U	13	U	13	U
Toluene	12	U	12	U	13	U	13	U	13	U
Trichloroethene	12	U	12	U	13	U	13	U	13	U
Trichlorofluoromethane(Freon-11)	12	U	12	U	13	U	13	U	13	U
Vinyl chloride	12	U	12	U	13	U	13	U	13	U
Xylene, total	12	U	12	U	13	U	13	U	13	U
cis-1,2-Dichloroethene	12	U	12	U	13	U	13	U	13	U
cis-1,3-Dichloropropene	12	U	12	U	13	U	13	U	13	U
trans-1,2-Dichloroethene	12	U	12	U	13	U	13	U	13	U
trans-1,3-Dichloropropene	12	U	12	U	13	U	13	U	13	U
Semi-volatile Organic Compounds (UG/KG)										
1,1-Biphenyl	400	U	370	U	460	U	420	U	460	U
2,4,5-Trichlorophenol	1,000	U	920	U	1,100	U	1,000	U	1,100	U
2,4,6-Trichlorophenol	400	U	370	U	460	U	420	U	460	U
2,4-Dichlorophenol	400	U	370	U	460	U	420	U	460	U
2,4-Dimethylphenol	400	U	370	U	460	U	420	U	460	U
2,4-Dinitrophenol	1,000	U	920	U	1,100	U	1,000	U	1,100	U
2,4-Dinitrotoluene	400	U	370	U	460	U	420	U	460	U
2,6-Dinitrotoluene	400	U	370	U	460	U	420	U	460	U
2-Chloronaphthalene	400	U	370	U	460	U	420	U	460	U
2-Chlorophenol	400	U	370	U	460	U	420	U	460	U
2-Methylnaphthalene	400	U	370	U	460	U	420	U	460	U
2-Methylphenol	400	U	370	U	460	U	420	U	460	U
2-Nitroaniline	1,000	U	920	U	1,100	U	1,000	U	1,100	U
2-Nitrophenol	400	U	370	U	460	U	420	U	460	U
3,3'-Dichlorobenzidine	400	U	370	U	460	U	420	U	460	U
3-Nitroaniline	1,000	U	920	U	1,100	U	1,000	U	1,100	U
4,6-Dinitro-2-methylphenol	1,000	U	920	U	1,100	U	1,000	U	1,100	U
4-Bromophenyl-phenylether	400	U	370	U	460	U	420	U	460	U

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Appendix C-8
Background Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM01	IS28MM16	IS28SO34	IS28SO39	
Sample ID	IS28SB01-0103	IS28SB16-0103	IS28SB34-0103	IS28SB39-0103	IS28SB39-0103P
Sample Date	05/15/03	05/14/03	05/16/03	05/16/03	05/16/03
Chemical Name					
4-Chloro-3-methylphenol	400 U	370 U	460 U	420 U	460 U
4-Chloroaniline	400 U	370 U	460 U	420 U	460 U
4-Chlorophenyl-phenylether	400 U	370 U	460 U	420 U	460 U
4-Methylphenol	400 U	370 U	460 U	420 U	460 U
4-Nitroaniline	1,000 U	920 U	1,100 U	1,000 U	1,100 U
4-Nitrophenol	1,000 U	920 U	1,100 U	1,000 U	1,100 U
Acenaphthene	400 U	370 U	460 U	420 U	460 U
Acenaphthylene	400 U	370 U	460 U	43 J	24 J
Acetophenone	400 U	370 U	460 U	420 U	460 U
Anthracene	400 U	370 U	460 U	37 J	25 J
Atrazine	400 U	370 U	460 U	420 U	460 U
Benzaldehyde	400 U	370 U	460 U	34 J	33 J
Benzo(a)anthracene	400 U	370 U	460 U	220 J	160 J
Benzo(a)pyrene	400 U	370 U	460 U	210 J	140 J
Benzo(b)fluoranthene	400 U	370 U	460 U	310 J	210 J
Benzo(g,h,i)perylene	400 U	370 U	460 U	420 U	460 U
Benzo(k)fluoranthene	400 U	370 U	460 U	140 J	80 J
Bis(2-chloro-1-methylethyl) ether	400 U	370 U	460 U	420 U	460 U
Butylbenzylphthalate	400 U	370 U	460 U	420 U	460 U
Caprolactam	400 U	370 U	460 U	420 U	460 U
Carbazole	400 U	370 U	460 U	420 U	460 U
Chrysene	400 U	370 U	460 U	330 J	180 J
Di-n-butylphthalate	34 B	370 U	58 B	420 U	65 B
Di-n-octylphthalate	400 U	370 U	460 U	420 U	460 U
Dibenz(a,h)anthracene	400 U	370 U	460 U	40 J	27 J
Dibenzofuran	400 U	370 U	460 U	420 U	460 U
Diethylphthalate	400 U	370 U	460 U	420 U	460 U
Dimethyl phthalate	400 U	370 U	460 U	420 U	460 U
Fluoranthene	400 U	370 U	460 U	460	250 J
Fluorene	400 U	370 U	460 U	420 U	460 U
Hexachlorobenzene	400 U	370 U	460 U	420 U	460 U
Hexachlorobutadiene	400 U	370 U	460 U	420 U	460 U
Hexachlorocyclopentadiene	400 U	370 U	460 U	420 U	460 U
Hexachloroethane	400 U	370 U	460 U	420 U	460 U
Indeno(1,2,3-cd)pyrene	400 U	370 U	460 U	170 J	96 J

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Appendix C-8
Background Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM01	IS28MM16	IS28SO34	IS28SO39	
Sample ID	IS28SB01-0103	IS28SB16-0103	IS28SB34-0103	IS28SB39-0103	IS28SB39-0103P
Sample Date	05/15/03	05/14/03	05/16/03	05/16/03	05/16/03
Chemical Name					
Isophorone	400 U	370 U	460 U	420 U	460 U
Naphthalene	400 U	370 U	460 U	420 U	460 U
Nitrobenzene	400 U	370 U	460 U	420 U	460 U
Pentachlorophenol	1,000 U	920 U	1,100 U	1,000 U	1,100 U
Phenanthrene	400 U	370 U	460 U	180 J	85 J
Phenol	400 U	370 U	460 U	420 U	24 J
Pyrene	400 U	19 J	460 U	500	280 J
bis(2-Chloroethoxy)methane	400 U	370 U	460 U	420 U	460 U
bis(2-Chloroethyl)ether	400 U	370 U	460 U	420 U	460 U
bis(2-Ethylhexyl)phthalate	400 U	370 U	460 U	140 J	460 U
n-Nitroso-di-n-propylamine	400 U	370 U	460 U	420 U	460 U
n-Nitrosodiphenylamine	400 U	370 U	460 U	420 U	460 U
Explosives (UG/KG)					
1,3,5-Trinitrobenzene	100 U	100 U	100 U	100 U	100 U
1,3-Dinitrobenzene	100 UL	100 U	100 UL	100 UL	100 UL
2,4,6-Trinitrotoluene	57 L	100 UL	100 UL	100 UL	100 UL
2,4-Dinitrotoluene	100 U	100 U	100 U	100 U	100 U
2,6-Dinitrotoluene	100 U	100 U	100 U	100 U	100 U
2-Amino-4,6-dinitrotoluene	100 U	100 U	100 U	100 U	100 U
2-Nitrotoluene	200 UL	200 U	200 UL	200 UL	200 UL
3-Nitrotoluene	200 UL	200 U	200 U	200 U	200 U
4-Amino-2,6-dinitrotoluene	100 UL	100 U	100 U	100 U	100 U
4-Nitrotoluene	200 U	200 U	200 U	200 U	200 U
HMX	200 UL	200 U	200 UL	200 UL	200 UL
Nitrobenzene	130 L	100 UL	100 UL	100 UL	100 UL
Nitroglycerin	6,100 U	6,000 U	6,800 U	6,400 U	7,400 U
Nitroguanidine	130 U	130 U	130 U	130 U	130 U
PETN	500 UL	500 U	500 U	500 U	500 U
Perchlorate	40 U	40 U	41 U	40 U	41 U
RDX	200 UL	200 U	200 UL	200 UL	200 UL
Tetryl	200 U	200 U	200 U	200 U	200 U
Total Metals (MG/KG)					
Aluminum	14,100	6,150	4,460	6,730	7,630

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Appendix C-8
Background Subsurface Soil Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM01	IS28MM16	IS28SO34	IS28SO39	
Sample ID	IS28SB01-0103	IS28SB16-0103	IS28SB34-0103	IS28SB39-0103	IS28SB39-0103P
Sample Date	05/15/03	05/14/03	05/16/03	05/16/03	05/16/03
Chemical Name					
Antimony	0.25 U	0.2 R	0.86 B	0.27 U	0.37 B
Arsenic	5.2	7.7 L	349	44.8	15.3
Barium	39.8	51.6	70.6	45.7	47.5
Beryllium	0.3 B	0.33 B	2.8 B	0.46 B	0.52 J
Cadmium	0.69 U	1.1 B	1.1 K	0.74 U	0.78 U
Calcium	278 J	369 J	1,660	236 J	276 J
Chromium	16.7	11.2	6.8	13.2	14.2
Cobalt	4.3 J	7.1 J	44.7	9.3 J	5.3 J
Copper	8.9 K	6	17	29.9	10.7
Iron	20,000	10,200	17,900	28,500	17,800
Lead	10	30.9	19.2	315	16.8
Magnesium	1,030	546 J	972	550 J	592 J
Manganese	107	403	660	52.6	60.2
Mercury	0.05 B	0.1 B	0.04 B	0.09 B	0.11 B
Nickel	7.8 B	3.9 J	16.4 B	21	6.9 J
Potassium	534 B	263 J	546 B	454 B	598 J
Selenium	0.39 U	0.46 J	0.41 U	0.54 B	0.45 U
Silver	0.9 U	0.73 U	1 B	0.96 U	1.02 U
Sodium	67.5 B	23.2 B	15.3 B	52.2 B	44.8 B
Thallium	0.56 U	0.46 U	1.1 B	0.6 U	0.63 U
Vanadium	31.1	15 K	24.4	25.2	28.2
Zinc	36.3	490	390	117	59.1
Wet Chemistry (MG/KG)					
% Solids	82	83	73	78	67

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Appendix C-9

Appendix C-9
Background In Situ Groundwater Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM01		IS28MM16			
Sample ID	IS28GW01-0503		IS28GW16-0503		IS28GW16-0503P	
Sample Date	05/15/03		05/15/03		05/15/03	
Chemical Name						
Volatile Organic Compounds (UG/L)						
1,1,1-Trichloroethane	10	U	10	U	10	U
1,1,2,2-Tetrachloroethane	10	U	10	U	10	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10	U	10	U	10	U
1,1,2-Trichloroethane	10	U	10	U	10	U
1,1-Dichloroethane	10	U	10	U	10	U
1,1-Dichloroethene	10	U	10	U	10	U
1,2,4-Trichlorobenzene	10	U	10	U	10	U
1,2-Dibromo-3-chloropropane	10	U	10	U	10	U
1,2-Dibromoethane	10	U	10	U	10	U
1,2-Dichlorobenzene	10	U	10	U	10	U
1,2-Dichloroethane	10	U	10	U	10	U
1,2-Dichloropropane	10	U	10	U	10	U
1,3-Dichlorobenzene	10	U	10	U	10	U
1,4-Dichlorobenzene	10	U	10	U	10	U
2-Butanone	10	U	10	U	10	U
2-Hexanone	10	U	10	U	10	U
4-Methyl-2-pentanone	10	U	10	U	10	U
Acetone	5	J	5	J	10	U
Benzene	10	U	10	U	10	U
Bromodichloromethane	10	U	10	U	10	U
Bromoform	10	U	10	U	10	U
Bromomethane	10	U	10	U	10	U
Carbon disulfide	10	U	10	U	10	U
Carbon tetrachloride	10	U	6	J	6	J
Chlorobenzene	10	U	10	U	10	U
Chloroethane	10	U	10	U	10	U
Chloroform	10	U	10	U	10	U
Chloromethane	10	U	10	U	10	U
Cumene	10	U	10	U	10	U
Cyclohexane	10	U	10	U	10	U
Dibromochloromethane	10	U	10	U	10	U
Dichlorodifluoromethane(Freon-12)	10	U	10	U	10	U
Ethylbenzene	10	U	10	U	10	U

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Appendix C-9
Background In Situ Groundwater Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM01		IS28MM16		IS28MM16	
Sample ID	IS28GW01-0503		IS28GW16-0503		IS28GW16-0503P	
Sample Date	05/15/03		05/15/03		05/15/03	
Chemical Name						
Methyl acetate	10	U	10	U	10	U
Methyl-tert-butyl ether (MTBE)	10	U	10	U	10	U
Methylcyclohexane	10	U	10	U	10	U
Methylene chloride	10	U	10	U	10	U
Styrene	10	U	10	U	10	U
Tetrachloroethene	10	U	10	U	10	U
Toluene	10	U	10	U	10	U
Trichloroethene	10	U	10	U	10	U
Trichlorofluoromethane(Freon-11)	10	U	10	U	10	U
Vinyl chloride	10	U	10	U	10	U
Xylene, total	10	U	10	U	10	U
cis-1,2-Dichloroethene	10	U	10	U	10	U
cis-1,3-Dichloropropene	10	U	10	U	10	U
trans-1,2-Dichloroethene	10	U	10	U	10	U
trans-1,3-Dichloropropene	10	U	10	U	10	U
Semi-volatile Organic Compounds (UG/L)						
1,1-Biphenyl	10	U	10	U	10	U
2,4,5-Trichlorophenol	25	U	25	U	25	U
2,4,6-Trichlorophenol	10	U	10	U	10	U
2,4-Dichlorophenol	10	U	10	U	10	U
2,4-Dimethylphenol	10	U	10	U	10	U
2,4-Dinitrophenol	25	U	25	U	25	U
2,4-Dinitrotoluene	10	U	10	U	10	U
2,6-Dinitrotoluene	10	U	10	U	10	U
2-Chloronaphthalene	10	U	10	U	10	U
2-Chlorophenol	10	U	10	U	10	U
2-Methylnaphthalene	10	U	10	U	10	U
2-Methylphenol	10	U	10	U	10	U
2-Nitroaniline	25	U	25	U	25	U
2-Nitrophenol	10	U	10	U	10	U
3,3'-Dichlorobenzidine	10	U	10	U	10	U
3-Nitroaniline	25	U	25	U	25	U
4,6-Dinitro-2-methylphenol	25	U	25	U	25	U
4-Bromophenyl-phenylether	10	U	10	U	10	U

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Appendix C-9
Background In Situ Groundwater Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM01		IS28MM16		IS28MM16	
Sample ID	IS28GW01-0503		IS28GW16-0503		IS28GW16-0503P	
Sample Date	05/15/03		05/15/03		05/15/03	
Chemical Name						
4-Chloro-3-methylphenol	10	U	10	U	10	U
4-Chloroaniline	10	U	10	U	10	U
4-Chlorophenyl-phenylether	10	U	10	U	10	U
4-Methylphenol	10	U	10	U	10	U
4-Nitroaniline	25	U	25	U	25	U
4-Nitrophenol	25	U	25	U	25	U
Acenaphthene	10	U	10	U	10	U
Acenaphthylene	10	U	10	U	10	U
Acetophenone	10	U	10	U	10	U
Anthracene	10	U	10	U	10	U
Atrazine	10	U	10	U	10	U
Benzaldehyde	10	U	10	U	10	U
Benzo(a)anthracene	10	U	10	U	10	U
Benzo(a)pyrene	10	U	10	U	10	U
Benzo(b)fluoranthene	10	U	10	U	10	U
Benzo(g,h,i)perylene	10	U	10	U	10	U
Benzo(k)fluoranthene	10	U	10	U	10	U
Bis(2-chloro-1-methylethyl) ether	10	U	10	U	10	U
Butylbenzylphthalate	10	U	10	U	10	U
Caprolactam	10	U	10	U	10	U
Carbazole	10	U	10	U	10	U
Chrysene	10	U	10	U	10	U
Di-n-butylphthalate	10	U	10	U	10	U
Di-n-octylphthalate	10	U	10	U	10	U
Dibenz(a,h)anthracene	10	U	10	U	10	U
Dibenzofuran	10	U	10	U	10	U
Diethylphthalate	10	U	10	U	10	U
Dimethyl phthalate	10	U	10	U	10	U
Fluoranthene	10	U	10	U	10	U
Fluorene	10	U	10	U	10	U
Hexachlorobenzene	10	U	10	U	10	U
Hexachlorobutadiene	10	U	10	U	10	U
Hexachlorocyclopentadiene	10	U	10	U	10	U
Hexachloroethane	10	U	10	U	10	U
Indeno(1,2,3-cd)pyrene	10	U	10	U	10	U

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Appendix C-9
Background In Situ Groundwater Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM01		IS28MM16		IS28MM16	
Sample ID	IS28GW01-0503		IS28GW16-0503		IS28GW16-0503P	
Sample Date	05/15/03		05/15/03		05/15/03	
Chemical Name						
Isophorone	10	U	10	U	10	U
Naphthalene	10	U	10	U	10	U
Nitrobenzene	10	U	10	U	10	U
Pentachlorophenol	25	U	25	U	25	U
Phenanthrene	10	U	10	U	10	U
Phenol	10	U	10	U	10	U
Pyrene	10	U	10	U	10	U
bis(2-Chloroethoxy)methane	10	U	10	U	10	U
bis(2-Chloroethyl)ether	10	U	10	U	10	U
bis(2-Ethylhexyl)phthalate	10	U	10	U	10	U
n-Nitroso-di-n-propylamine	10	U	10	U	10	U
n-Nitrosodiphenylamine	10	U	10	U	10	U
Explosives (UG/L)						
1,3,5-Trinitrobenzene	0.26	U	0.26	U	0.26	U
1,3-Dinitrobenzene	0.26	U	0.26	U	0.26	U
2,4,6-Trinitrotoluene	0.26	U	0.26	U	0.26	U
2,4-Dinitrotoluene	0.26	U	0.26	U	0.26	U
2,6-Dinitrotoluene	0.26	U	0.26	U	0.26	U
2-Amino-4,6-dinitrotoluene	0.26	U	0.26	U	0.26	U
2-Nitrotoluene	0.52	U	0.52	U	0.52	U
3-Nitrotoluene	0.52	U	0.52	U	0.52	U
4-Amino-2,6-dinitrotoluene	0.26	U	0.26	U	0.26	U
4-Nitrotoluene	0.52	U	0.52	U	0.52	U
HMX	0.52	U	0.52	U	0.52	U
Nitrobenzene	0.26	U	0.26	U	0.26	U
Nitroglycerin	1,000	U	1,000	U	1,000	U
Nitroguanidine	10	U	10	U	10	U
PETN	1.3	U	1.3	U	1.3	U
Perchlorate	4	U	4	U	4	U
RDX	0.52	U	0.52	U	0.52	U
Tetryl	0.52	U	0.52	U	0.52	U
Dissolved Metals (UG/L)						
Aluminum	39	B	38.3	B	40.7	B

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Appendix C-9
Background In Situ Groundwater Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MM01		IS28MM16		IS28MM16	
Sample ID	IS28GW01-0503		IS28GW16-0503		IS28GW16-0503P	
Sample Date	05/15/03		05/15/03		05/15/03	
Chemical Name						
Antimony	1.33	U	1.33	U	1.33	U
Arsenic	1.8	U	1.8	U	2.2	B
Barium	38.7	B	31.2	B	30.2	B
Beryllium	0.31	U	0.31	U	0.31	U
Cadmium	3.66	U	3.66	U	3.66	U
Calcium	1,980	B	1,010	B	945	B
Chromium	0.57	U	0.57	U	0.57	U
Cobalt	9.5	B	2.4	B	2.8	B
Copper	2.38	U	2.38	U	2.38	U
Iron	1,860		178		168	
Lead	0.91	U	0.91	U	0.91	U
Magnesium	1,020	B	724	B	698	B
Manganese	160		29.1		26.8	
Mercury	0.06	B	0.06	B	0.06	B
Nickel	12	B	11.7	U	11.7	U
Potassium	2,850	B	1,620	B	1,500	B
Selenium	2.1	U	2.1	U	2.1	U
Silver	0.57	U	0.57	U	0.57	U
Sodium	16,100		16,800		16,000	
Thallium	4.6	B	5.8	B	3.1	B
Vanadium	4.7	U	4.7	U	4.7	U
Zinc	135		119		104	
Wet Chemistry (MG/L)						
Total organic carbon (TOC)	2		1		1	

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
U - Analyte not detected

Appendix C-10

Appendix C-10
Background Groundwater Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MW01		IS28MW010903P	
Sample ID	IS28MW010903			
Sample Date	09/09/03		09/09/03	
Chemical Name				
Volatile Organic Compounds (UG/L)				
1,1,1-Trichloroethane	10	U	10	U
1,1,2,2-Tetrachloroethane	10	U	10	U
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	10	U	10	U
1,1,2-Trichloroethane	10	U	10	U
1,1-Dichloroethane	10	U	10	U
1,1-Dichloroethene	10	U	10	U
1,2,4-Trichlorobenzene	10	U	10	U
1,2-Dibromo-3-chloropropane	10	U	10	U
1,2-Dibromoethane	10	U	10	U
1,2-Dichlorobenzene	10	U	10	U
1,2-Dichloroethane	10	U	10	U
1,2-Dichloroethene (total)	10	U	10	U
1,2-Dichloropropane	10	U	10	U
1,3-Dichlorobenzene	10	U	10	U
1,4-Dichlorobenzene	10	U	10	U
2-Butanone	10	U	10	U
2-Hexanone	10	U	10	U
4-Methyl-2-pentanone	10	U	10	U
Acetone	10	U	10	U
Benzene	10	U	10	U
Bromodichloromethane	10	U	10	U
Bromoform	10	U	10	U
Bromomethane	10	U	10	U
Carbon disulfide	10	U	10	U
Carbon tetrachloride	10	U	10	U
Chlorobenzene	10	U	10	U
Chloroethane	10	U	10	U
Chloroform	10	U	10	U
Chloromethane	10	U	10	U
Cumene	10	U	10	U
Cyclohexane	10	U	10	U
Dibromochloromethane	10	U	10	U
Dichlorodifluoromethane(Freon-12)	10	U	10	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high

Appendix C-10
Background Groundwater Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MW01			
Sample ID	IS28MW010903		IS28MW010903P	
Sample Date	09/09/03		09/09/03	
Chemical Name				
Ethylbenzene	10	U	10	U
Methyl acetate	10	U	10	U
Methyl-tert-butyl ether (MTBE)	10	U	10	U
Methylcyclohexane	10	U	10	U
Methylene chloride	10	U	10	U
Styrene	10	U	10	U
Tetrachloroethene	10	U	10	U
Toluene	10	U	10	U
Trichloroethene	10	U	10	U
Trichlorofluoromethane(Freon-11)	10	U	10	U
Vinyl chloride	10	U	10	U
Xylene, total	10	U	10	U
cis-1,2-Dichloroethene	10	U	10	U
cis-1,3-Dichloropropene	10	U	10	U
m- and p-Xylene	10	U	10	U
o-Xylene	10	U	10	U
trans-1,2-Dichloroethene	10	U	10	U
trans-1,3-Dichloropropene	10	U	10	U
Semi-volatile Organic Compounds (UG/L)				
1,1-Biphenyl	10	U	10	U
2,4,5-Trichlorophenol	25	U	25	U
2,4,6-Trichlorophenol	10	U	10	U
2,4-Dichlorophenol	10	U	10	U
2,4-Dimethylphenol	10	U	10	U
2,4-Dinitrophenol	25	U	25	U
2,4-Dinitrotoluene	10	U	10	U
2,6-Dinitrotoluene	10	U	10	U
2-Chloronaphthalene	10	U	10	U
2-Chlorophenol	10	U	10	U
2-Methylnaphthalene	10	U	10	U
2-Methylphenol	10	U	10	U
2-Nitroaniline	25	U	25	U
2-Nitrophenol	10	U	10	U
3,3'-Dichlorobenzidine	10	U	10	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high

Appendix C-10
Background Groundwater Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MW01			
Sample ID	IS28MW010903		IS28MW010903P	
Sample Date	09/09/03		09/09/03	
Chemical Name				
3-Nitroaniline	25	U	25	U
4,6-Dinitro-2-methylphenol	25	U	25	U
4-Bromophenyl-phenylether	10	U	10	U
4-Chloro-3-methylphenol	10	U	10	U
4-Chloroaniline	10	U	10	U
4-Chlorophenyl-phenylether	10	U	10	U
4-Methylphenol	10	U	10	U
4-Nitroaniline	25	U	25	U
4-Nitrophenol	25	U	25	U
Acenaphthene	10	U	10	U
Acenaphthylene	10	U	10	U
Acetophenone	0.8	B	0.8	B
Anthracene	10	U	10	U
Atrazine	10	U	10	U
Benzaldehyde	10	U	10	U
Benzo(a)anthracene	10	U	10	U
Benzo(a)pyrene	10	U	10	U
Benzo(b)fluoranthene	10	U	10	U
Benzo(g,h,i)perylene	10	U	10	U
Benzo(k)fluoranthene	10	U	10	U
Bis(2-chloro-1-methylethyl) ether	10	U	10	U
Butylbenzylphthalate	10	U	10	U
Caprolactam	10	U	10	U
Carbazole	10	U	10	U
Chrysene	10	U	10	U
Di-n-butylphthalate	0.6	B	0.3	B
Di-n-octylphthalate	10	U	10	U
Dibenz(a,h)anthracene	10	U	10	U
Dibenzofuran	10	U	10	U
Diethylphthalate	10	U	0.3	B
Dimethyl phthalate	10	U	10	U
Fluoranthene	10	U	10	U
Fluorene	10	U	10	U
Hexachlorobenzene	10	U	10	U
Hexachlorobutadiene	10	U	10	U

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high

Appendix C-10
Background Groundwater Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MW01			
Sample ID	IS28MW010903		IS28MW010903P	
Sample Date	09/09/03		09/09/03	
Chemical Name				
Hexachlorocyclopentadiene	10	U	10	U
Hexachloroethane	10	U	10	U
Indeno(1,2,3-cd)pyrene	10	U	10	U
Isophorone	10	U	10	U
Naphthalene	10	U	10	U
Nitrobenzene	10	U	10	U
Pentachlorophenol	25	U	25	U
Phenanthrene	10	U	10	U
Phenol	46	B	53	B
Pyrene	10	U	10	U
bis(2-Chloroethoxy)methane	10	U	10	U
bis(2-Chloroethyl)ether	10	U	10	U
bis(2-Ethylhexyl)phthalate	250	J	290	J
n-Nitroso-di-n-propylamine	10	U	10	U
n-Nitrosodiphenylamine	10	U	10	U
Explosives (UG/L)				
1,3,5-Trinitrobenzene	0.26	UJ	0.26	UJ
1,3-Dinitrobenzene	0.26	UJ	0.26	UJ
2,4,6-Trinitrotoluene	0.26	UJ	0.26	UJ
2,4-Dinitrotoluene	0.26	UJ	0.26	UJ
2,6-Dinitrotoluene	0.26	UJ	0.26	UJ
2-Amino-4,6-dinitrotoluene	0.26	UJ	0.26	UJ
2-Nitrotoluene	0.52	UJ	0.52	UJ
3-Nitrotoluene	0.52	UJ	0.52	UJ
4-Amino-2,6-dinitrotoluene	0.26	UJ	0.26	UJ
4-Nitrotoluene	0.52	UJ	0.52	UJ
HMX	0.52	UJ	0.52	UJ
Nitrobenzene	0.26	UJ	0.26	UJ
Nitroglycerin	1,000	U	1,000	U
Nitroguanidine	10	U	10	U
PETN	1.3	UJ	1.3	UJ
Perchlorate	4	U	4	U
RDX	0.52	UJ	0.52	UJ
Tetryl	0.52	UJ	0.52	UJ

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high

Appendix C-10
Background Groundwater Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MW01		IS28MW01	
Sample ID	IS28MW010903		IS28MW010903P	
Sample Date	09/09/03		09/09/03	
Chemical Name				
Total Metals (UG/L)				
Aluminum	553		692	
Antimony	1.74	U	1.74	U
Arsenic	342		347	
Barium	32.4	J	32.9	J
Beryllium	0.22	U	0.22	U
Cadmium	0.61	B	0.59	B
Calcium	4,620	J	4,620	J
Chromium	2.2	J	1.7	J
Cobalt	7.2	J	5.8	J
Copper	36.2	K	21.7	J
Iron	11,500		11,700	
Lead	4.9	K	6.8	
Magnesium	3,420	J	3,440	J
Manganese	434		434	
Mercury	0.15	B	0.11	B
Nickel	7.4	J	6	J
Potassium	2,050	B	1,570	B
Selenium	2.32	UL	3.6	B
Silver	1.16	U	1.16	U
Sodium	23,000		24,600	
Thallium	4.8	B	4.2	B
Vanadium	0.74	U	1.3	B
Zinc	951		969	
Dissolved Metals (UG/L)				
Aluminum	252		338	
Antimony	1.74	U	1.74	U
Arsenic	317		292	
Barium	31.9	J	31.6	J
Beryllium	0.22	U	0.22	U
Cadmium	0.4	B	0.56	B
Calcium	4,530	J	4,430	J
Chromium	1.5	J	0.93	J

NA - Not analyzed
B - Analyte not detected above associated blank
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K - Reported value may be biased high

Appendix C-10
Background Groundwater Raw Data
Remedial Investigation Report Site 28
IHDIV-NSWC

Station ID	IS28MW01	
Sample ID	IS28MW010903	IS28MW010903P
Sample Date	09/09/03	09/09/03
Chemical Name		
Cobalt	6.6 J	6.4 J
Copper	10.3 J	7.6 B
Iron	12,900	13,200
Lead	2.2 J	2.2 J
Magnesium	3,390 J	3,320 J
Manganese	441	434
Mercury	0.16 B	0.16 B
Nickel	5.1 J	4.8 J
Potassium	1,200 B	1,390 B
Selenium	2.5 B	2.6 B
Silver	1.16 U	1.16 U
Sodium	20,500	19,400
Thallium	2.77 U	2.77 U
Vanadium	0.74 U	0.74 U
Zinc	886	868
Wet Chemistry (MG/L)		
Dissolved organic carbon	6.6	6

NA - Not analyzed
B - Analyte not detected above associated blank
J - Reported value is estimated
K - Reported value may be biased high

Appendix D
Well Completion Diagrams

Well Completion Reports

Note that the monitoring well number is labeled in the diagram on the bottom right corner. After the wells were installed, the well completion report diagrams were made from an outdated map of the wells' prospective locations. Therefore, the diagrams in the bottom right corner of the well completion reports are incorrect. The correct locations of the wells are shown in Figure 2-4. These locations were measured by professional surveyors.

C 1 | 9933 | SEQUENCE NO. (MDE USE ONLY)

1 2 3 6 (THIS NUMBER IS TO BE PUNCHED COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 20794

CO USE ONLY
E Received
MM DD YY
8 13

DATE WELL COMPLETED
MM DD YY
09 19 93
15 20

Depth of Well
22 60 26
(TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL"
CH - 94 - 5540
28 29 30 31 32 33 34 35 36 37

OWNER US Navy
STREET OR RFD NSWC Indian Head (last name / first name) TOWN Indian Head, MD 20640
SUBDIVISION SECTION LOT

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
Brown moist Loose Fine Sand	0	2	
Brown wet Loose Fine Sand Little Silt	2	6	✓

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E ELECTRIC LOG OBTAINED
- P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: MD 017
DRILLERS SIGNATURE
(MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO.: ___ D ___

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) yes [Y] no [N] (44)

TYPE OF GROUTING MATERIAL (Circle one)
CEMENT [CM] BENTONITE CLAY [BC] (45 46)

NO. OF BAGS ____ NO. OF POUNDS 5 (45 46)

GALLONS OF WATER 1

DEPTH OF GROUT SEAL (to nearest foot)
from 0 (46 TOP 52) ft. to 1 (54 BOTTOM 58) ft.
(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below:
[ST] STEEL [CO] CONCRETE [PL] PLASTIC [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL (60 61)	2 (63 64)	1 (66 70)

OTHER CASING (if used) — EACH CASING

	diameter inch	depth (feet) from	depth (feet) to

SCREEN RECORD
screen type or open hole insert appropriate code below:
[ST] STEEL [BR] BRASS BRONZE [HO] OPEN HOLE [PL] PLASTIC [OT] OTHER

C 2 (1 2)

DEPTH (nearest ft.) — EACH SCREEN

1	PL (8 9)	1 (11 15)	6 (17 21)
2	(23 24)	(26 30)	(32 36)
3	(38 39)	(41 45)	(47 51)

SLOT SIZE 1 .010 2 ____ 3 ____

DIAMETER OF SCREEN 2 (58 60) (NEAREST INCH)

GRAVEL PACK — from 1 to 6

IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68 (68)

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (70) (E.R.O.S.) (72) W Q (74 75 76)
TELESCOPE CASING | LOG INDICATOR | OTHER DATA

C 3 (1 2)

PUMPING TEST
HOURS PUMPED (nearest hour) 1 (8 9)

PUMPING RATE (gal. per min.) 1 (11 15)

METHOD USED TO MEASURE PUMPING RATE

WATER LEVEL (distance from land surface)

BEFORE PUMPING 1 (17 20) ft.

WHEN PUMPING ____ (22 25) ft.

TYPE OF PUMP USED (for test)
- [A] air (27)
- [P] piston (27)
- [T] turbine (27)
- [C] centrifugal (27)
- [R] rotary (27)
- [O] other (describe below) (27)
- [J] jet (27)
- [S] submersible (27)

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO) YES NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. (29)

CAPACITY: GALLONS PER MINUTE (to nearest gallon) (31 35)

PUMP HORSE POWER (37 41)

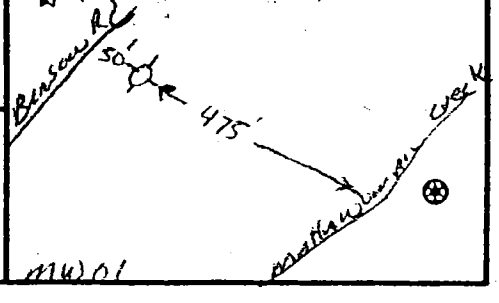
PUMP COLUMN LENGTH (nearest ft.) (43 47)

CASING HEIGHT (circle appropriate box and enter casing height)
- [+] above (48)
- [–] below (49)

LAND SURFACE

(nearest foot) 2 (50 51)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



DENV-CR00

DRILLER

C 1 9932 — SEQUENCE NO. (MDE USE ONLY)

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 20794

ST/CO USE ONLY
DATE Received MM DD YY

DATE WELL COMPLETED: MM 05 DD 20 YY 03

Depth of Well: 4 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": CH - 94 - 5539

OWNER US Navy (last name / first name)

STREET OR RFD NSWC Indian Head TOWN Indian Head, MD 20640

SUBDIVISION SECTION LOT

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
Brown moist Coarse Fine Sand	0	1	
Brown wet Coarse Fine Sand Little Silt	1	4	✓

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED: yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: MD 0472

DRILLERS SIGNATURE
(MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO.: __ D ____

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box): yes [Y] no [N]

TYPE OF GROUTING MATERIAL (Circle one)

CEMENT [CM] BENTONITE CLAY [BC]

NO. OF BAGS ____ NO. OF POUNDS 5

GALLONS OF WATER 1

DEPTH OF GROUT SEAL (to nearest foot)

from 0 ft. (TOP) to 1 ft. (BOTTOM) (enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below

[ST] STEEL [CO] CONCRETE [PL] PLASTIC [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL	2	1

OTHER CASING (if used)

EACH CASING	diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole insert appropriate code below

[ST] STEEL [BR] BRASS BRONZE [HO] OPEN HOLE [PL] PLASTIC [OT] OTHER

DEPTH (nearest ft.)

EACH SCREEN		from	to
1	PL	1	4
2			
3			

SLOT SIZE 1 .010 2 ____ 3 ____

DIAMETER OF SCREEN 2 (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

from	to
1	4

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T (E.R.O.S.) W Q

TELESCOPE CASING ____ LOG INDICATOR ____ OTHER DATA ____

C 3 — PUMPING TEST

HOURS PUMPED (nearest hour) 1

PUMPING RATE (gal. per min.) 1

METHOD USED TO MEASURE PUMPING RATE

WATER LEVEL (distance from land surface)

BEFORE PUMPING 1 ft.

WHEN PUMPING 1 ft.

TYPE OF PUMP USED (for test)

[A] air [P] piston [T] turbine [C] centrifugal [R] rotary [O] other (describe below) [J] jet [S] submersible

PUMP INSTALLED

DRILLER INSTALLED PUMP (CIRCLE) (YES or NO): YES (NO)

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29.

CAPACITY: GALLONS PER MINUTE (to nearest gallon)

PUMP HORSE POWER

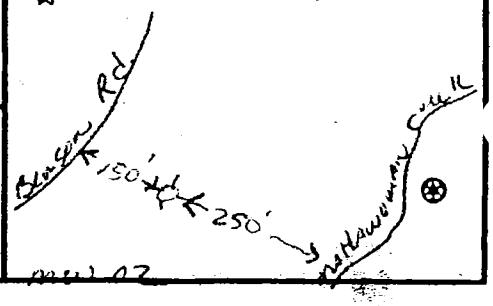
PUMP COLUMN LENGTH (nearest ft.)

CASING HEIGHT (circle appropriate box and enter casing height)

[+] above [–] below LAND SURFACE (nearest foot) 2

LOCATION OF WELL ON LOT

SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



DENV-CR00 DRILLER

CO 29930 — SEQUENCE NO. (MDE USE ONLY)

(THIS NUMBER IS TO BE PUNCHED COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 20794

MDE USE ONLY — DATE Received MM DD YY

DATE WELL COMPLETED: 08 19 03

Depth of Well: 14 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": CH 04 5538

OWNER: US Navy (last name) (first name)

STREET OR RFD: NSWC Indian Head TOWN: Indian Head, MD 20640

SUBDIVISION: SECTION: LOT:

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
Brown moist Dense F/c Sand	0	8	
Brown wet Dense F/c Sand Some S.CT	8	14	✓

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED: yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: MGD017

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO.: ___ D ___

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box): yes [Y] no [N]

TYPE OF GROUTING MATERIAL (Circle one)

CEMENT [CM] BENTONITE CLAY [BC]

NO. OF BAGS 1 NO. OF POUNDS 5

GALLONS OF WATER 7

DEPTH OF GROUT SEAL (to nearest foot)

from 0 (TOP) ft. to 7 (BOTTOM) ft.

(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below

[ST] STEEL [CO] CONCRETE [PL] PLASTIC [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL	2	4

OTHER CASING (if used)

EACH CASING	diameter inch	depth (feet) from	depth (feet) to

SCREEN RECORD
screen type or open hole insert appropriate code below

[ST] STEEL [BR] BRASS [HO] OPEN HOLE [BRONZE] [PL] PLASTIC [OT] OTHER

C 2

DEPTH (nearest ft.)

EACH SCREEN		DEPTH (nearest ft.)	
1	PL	4	14
2			
3			

SLOT SIZE 1 .010 2 ___ 3 ___

DIAMETER OF SCREEN 2 (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68: from 2 to 14

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T ___ (E.R.O.S.) ___ W Q ___

TELESCOPE CASING ___ LOG INDICATOR ___ OTHER DATA ___

C 3

PUMPING TEST
HOURS PUMPED (nearest hour): 1

PUMPING RATE (gal. per min.): 1

METHOD USED TO MEASURE PUMPING RATE:

WATER LEVEL (distance from land surface)

BEFORE PUMPING: 1 ft.

WHEN PUMPING: 1 ft.

TYPE OF PUMP USED (for test)

[A] air [P] piston [T] turbine [C] centrifugal [R] rotary [O] other (describe below) [J] jet [S] submersible

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO): YES (NO)

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29.

CAPACITY: GALLONS PER MINUTE (to nearest gallon)

PUMP HORSE POWER

PUMP COLUMN LENGTH (nearest ft.)

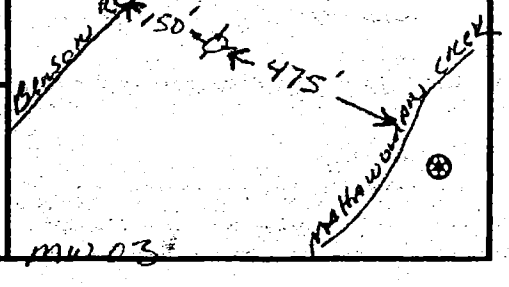
CASING HEIGHT (circle appropriate box and enter casing height)

[F] above LAND SURFACE

[—] below

(nearest foot): 2

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



DENV-CR00

DRILLER

CT 9967 | SEQUENCE NO. (MDE USE ONLY)

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 20794

ST/CO USE ONLY
DATE Received MM DD YY

DATE WELL COMPLETED: MM 08 DD 20 YY 03

Depth of Well: 15 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": CH 94 5536

OWNER (last name) US Navy (first name)
STREET OR RFD NSWC Indian Head TOWN Indian Head, MD 20640
SUBDIVISION SECTION LOT

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
Brown moist Clayey F/c Sand	0	9	
Brown wet Clayey F/c Sand some S.C.F Little F/c Gravel	9	15	✓

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED: yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E ELECTRIC LOG OBTAINED
- P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: MGD012
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)
LIC. NO.: ___ D ___

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box): yes [Y] no [N]
TYPE OF GROUTING MATERIAL (Circle one)
CEMENT [CM] BENTONITE CLAY [BC]
NO. OF BAGS: 1 NO. OF POUNDS: 5
GALLONS OF WATER: 7
DEPTH OF GROUT SEAL (to nearest foot)
from 0 ft. (TOP) to 3 ft. (BOTTOM)
(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below
[ST] STEEL [CO] CONCRETE [PL] PLASTIC [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL	7	5

OTHER CASING (if used)

EACH CASING	diameter inch	depth (feet) from	depth (feet) to

SCREEN RECORD
screen type or open hole insert appropriate code below
[ST] STEEL [BR] BRASS BRONZE [HO] OPEN HOLE [PL] PLASTIC [OT] OTHER

C 2

EACH SCREEN		DEPTH (nearest ft.)	
1	PL	5	15
2			
3			

SLOT SIZE 1: 010 2: ___ 3: ___
DIAMETER OF SCREEN: 2 (NEAREST INCH)

GRAVEL PACK: from 3 to 15
IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q

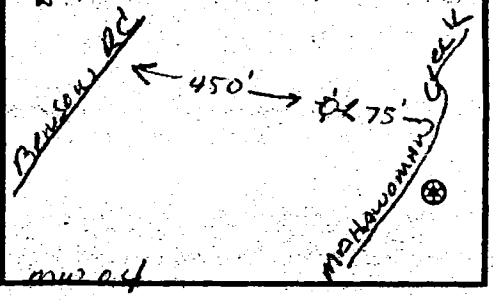
TELESCOPE CASING | LOG INDICATOR | OTHER DATA

C 3

PUMPING TEST
HOURS PUMPED (nearest hour): 1
PUMPING RATE (gal. per min.): 1
METHOD USED TO MEASURE PUMPING RATE:
WATER LEVEL (distance from land surface)
BEFORE PUMPING: 1 ft.
WHEN PUMPING: 1 ft.
TYPE OF PUMP USED (for test)
[A] air [P] piston [T] turbine [C] centrifugal [R] rotary [O] other (describe below) [J] jet [S] submersible

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO): YES NO
IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29.
CAPACITY: GALLONS PER MINUTE (to nearest gallon)
PUMP HORSE POWER
PUMP COLUMN LENGTH (nearest ft.)
CASING HEIGHT (circle appropriate box and enter casing height): [+] above [−] below LAND SURFACE (nearest foot): 2

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



DENV-CR00 DRILLER

CT 9968 SEQUENCE NO. (MDE USE ONLY)

(THIS NUMBER IS TO BE PUNCHED COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED

COUNTY NUMBER 20794

/CO USE ONLY
ATE Received MM DD YY

DATE WELL COMPLETED: MM 08 DD 21 YY 03

Depth of Well: 35 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": CH 94 5537

OWNER: US Navy (last name) (first name)

STREET OR RFD: NSWC Indian Head TOWN: Indian Head, MD 20640

SUBDIVISION: SECTION: LOT:

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
Brown moist med Dense to Dense F/m Sand c. Hic Silt Trace F/c Gravel	0	30	
Brown wet Dense F/c Sand Some Silt	30	35	✓

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED: yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E ELECTRIC LOG OBTAINED
- P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: MD 017

DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO.: ___ D ___

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box): yes [Y] no [N]

TYPE OF GROUTING MATERIAL (Circle one)

CEMENT [C M] BENTONITE CLAY [B C]

NO. OF BAGS 4 NO. OF POUNDS 20

GALLONS OF WATER 30

DEPTH OF GROUT SEAL (to nearest foot)

from 0 ft. (TOP) to 23 ft. (BOTTOM)

(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below

[S T] STEEL [C O] CONCRETE [P L] PLASTIC [O T] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
PL	2	25

OTHER CASING (if used)

	diameter inch	depth (feet) from	to
EACH CASING			

SCREEN RECORD
screen type or open hole insert appropriate code below

[S T] STEEL [B R] BRASS BRONZE [H O] OPEN HOLE [P L] PLASTIC [O T] OTHER

C 2

DEPTH (nearest ft.)

		from	to
EACH SCREEN	1	PL	25	35
	2			
	3			

SLOT SIZE 1 .010 2 ___ 3 ___

DIAMETER OF SCREEN 2 (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68: from 23 to 35

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

T ___ (E.R.O.S.) ___ W Q

TELESCOPE CASING | LOG INDICATOR | OTHER DATA

C 3

PUMPING TEST
HOURS PUMPED (nearest hour): 1

PUMPING RATE (gal. per min.): 1

METHOD USED TO MEASURE PUMPING RATE:

WATER LEVEL (distance from land surface)

BEFORE PUMPING: 1 ft.

WHEN PUMPING: 1 ft.

TYPE OF PUMP USED (for test)

[A] air [P] piston [T] turbine

[C] centrifugal [R] rotary [O] other (describe below)

[J] jet [S] submersible

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO): YES (NO)

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29:

CAPACITY: GALLONS PER MINUTE (to nearest gallon)

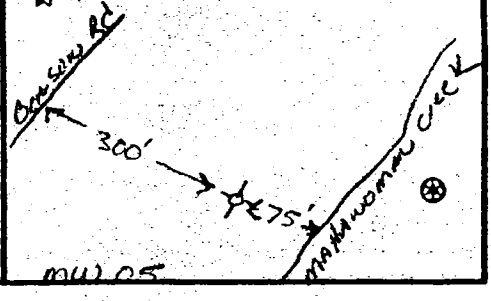
PUMP HORSE POWER

PUMP COLUMN LENGTH (nearest ft.)

CASING HEIGHT (circle appropriate box and enter casing height)

[+] above [–] below LAND SURFACE (nearest) foot: 2

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



DENV-CR00

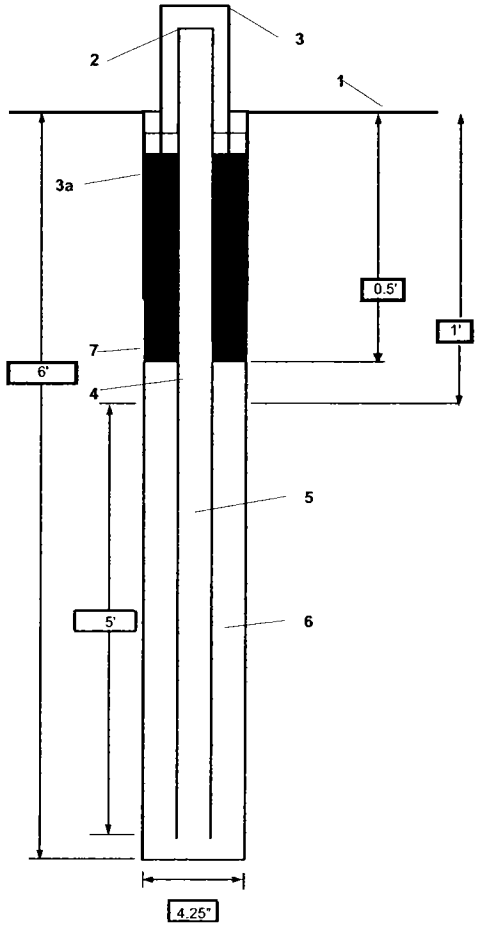
DRILLER

CH2MHILL

PROJECT NUMBER	WELL NUMBER		
152962	IS28MW01	SHEET 1	OF 1

WELL COMPLETION DIAGRAM

PROJECT : Indian Head Site 28 Monitoring Well Installation
LOCATION : Indian Head, Maryland
DRILLING METHOD AND EQUIPMENT USED : 4.25-inch Hollow Stem Augers
DRILLING CONTRACTOR : Parratt Wolff START : 08/19/03 END : 08/19/03 GEOLOGIST : C. Brown



1- Ground elevation at well

2- Top of casing elevation

3- Wellhead protection cover type: 2' Stickup
a) Dia./type of outer surface casing: 4"
b) concrete pad dimensions: 4 x 4

4- Dia./type of inner well casing: 2" I.D. Sch 40 PVC

5- Type/slot size of screen: 2" PVC Screen (.010 mm)

6- Type screen filter: #2 Sand

7- Type of seal: Bentonite seal, #2 Sand
a) Quantity used

8- Grout
a) Grout mix used: 1 bag Portland + 5 lbs bentonite per 8 gal water
b) Method of placement: Tremmie pipe

Development method: Pump/Surge

Development time: 1 hr

Estimated purge volume

CH2MHILL

PROJECT NUMBER	WELL NUMBER		
152962	IS28MW02	SHEET 1	OF 1

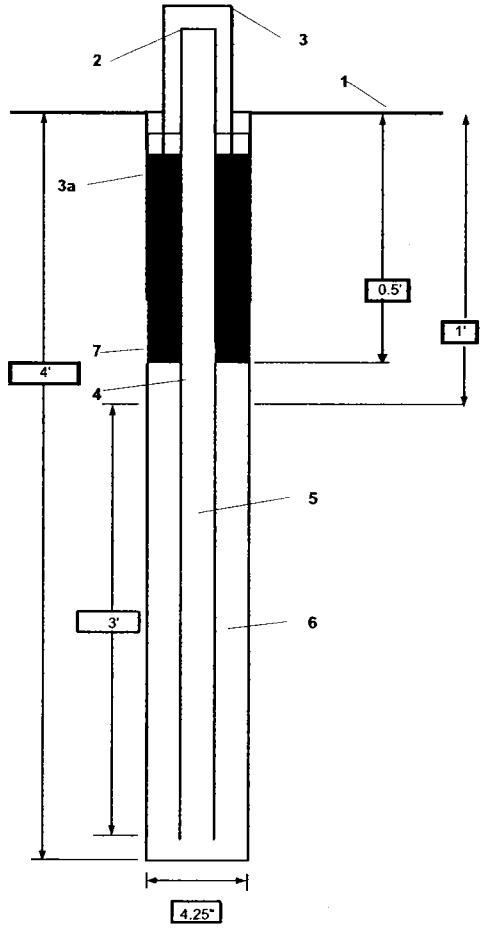
WELL COMPLETION DIAGRAM

PROJECT : Indian Head Site 28 Monitoring Well Installation

LOCATION : Indian Head, Maryland

DRILLING METHOD AND EQUIPMENT USED : 4.25-inch Hollow Stem Augers

DRILLING CONTRACTOR : Parratt Wolff START : 08/19/03 END : 08/19/03 GEOLOGIST : C. Brown



1- Ground elevation at well	
2- Top of casing elevation	
3- Wellhead protection cover type	2' Stickup
a) Dia./type of outer surface casing	4"
b) concrete pad dimensions	4 x 4
4- Dia./type of inner well casing	2" I.D. Sch 40 PVC
5- Type/slot size of screen	2" PVC Screen (.010 mm)
6- Type screen filter	#2 Sand
7- Type of seal	Bentonite seal, #2 Sand
a) Quantity used	
8- Grout	
a) Grout mix used	1 bag Portland + 5 lbs bentonite per 8 gal water
b) Method of placement	Tremmie pipe
Development method	Pump/Surge
Development time	1 hr
Estimated purge volume	

CH2MHILL

PROJECT NUMBER	WELL NUMBER		
152962	IS28MW03	SHEET 1	OF 1

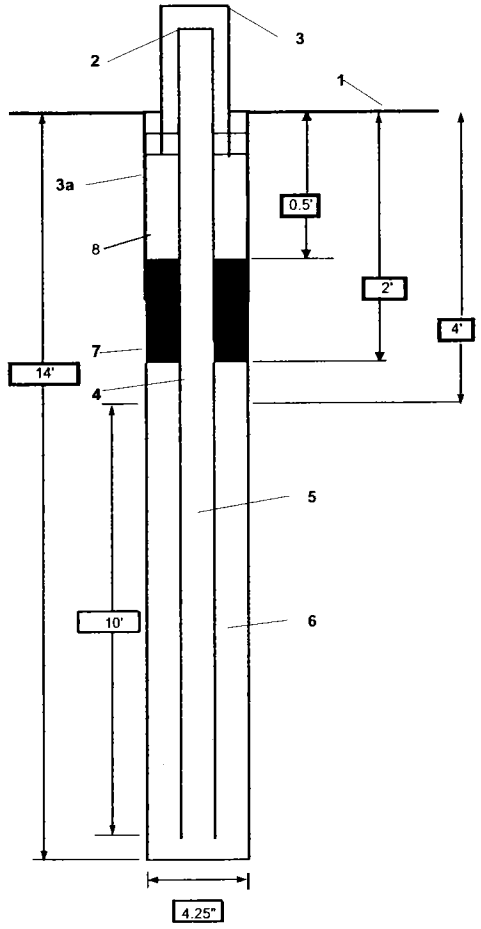
WELL COMPLETION DIAGRAM

PROJECT : Indian Head Site 28 Monitoring Well Installation

LOCATION : Indian Head, Maryland

DRILLING METHOD AND EQUIPMENT USED : 4.25-inch Hollow Stem Augers

DRILLING CONTRACTOR : Parratt Wolff START : 08/19/03 END : 08/19/03 GEOLOGIST : C. Brown



1- Ground elevation at well

2- Top of casing elevation

3- Wellhead protection cover type: 2' Stickup
a) Dia./type of outer surface casing: 4"
b) concrete pad dimensions: 4 x 4

4- Dia./type of inner well casing: 2" I.D. Sch 40 PVC

5- Type/slot size of screen: 2" PVC Screen (.010 mm)

6- Type screen filter: #2 Sand

7- Type of seal: Bentonite seal, #2 Sand
a) Quantity used

8- Grout
a) Grout mix used: 1 bag Portland + 5 lbs bentonite per 8 gal water
b) Method of placement: Tremmie pipe

Development method: Pump/Surge

Development time: 1 hr

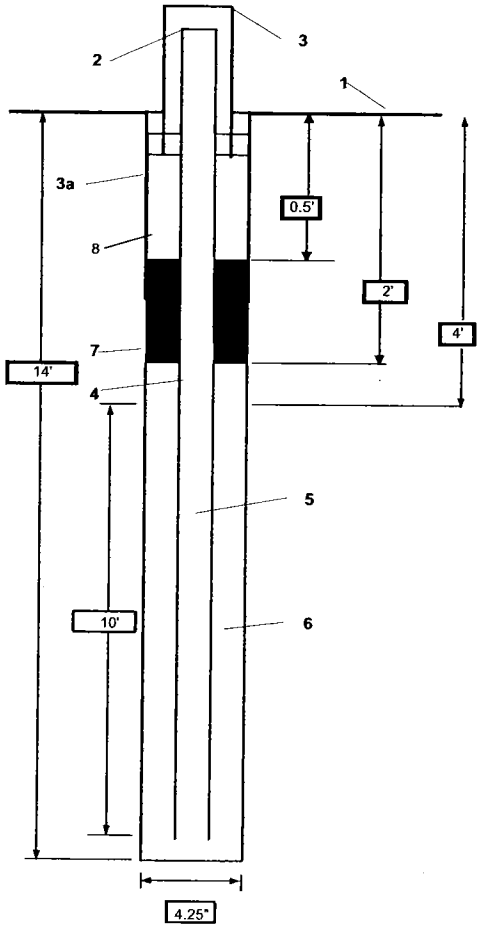
Estimated purge volume

CH2MHILL

PROJECT NUMBER	WELL NUMBER		
152962	IS28MW04	SHEET 1	OF 1

WELL COMPLETION DIAGRAM

PROJECT : Indian Head Site 28 Monitoring Well Installation
LOCATION : Indian Head, Maryland
DRILLING METHOD AND EQUIPMENT USED : 4.25-inch Hollow Stem Augers
DRILLING CONTRACTOR : Parratt Wolff START : 08/20/03 END : 08/20/03 GEOLOGIST : C. Brown



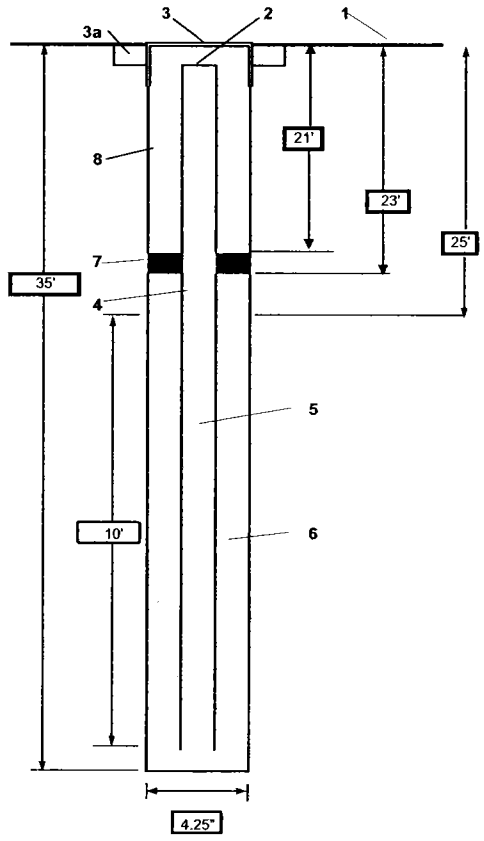
1- Ground elevation at well
2- Top of casing elevation
3- Wellhead protection cover type: 2' Stickup
a) Dia./type of outer surface casing: 4"
b) concrete pad dimensions: 4 x 4
4- Dia./type of inner well casing: 2" I.D. Sch 40 PVC
5- Type/slot size of screen: 2" PVC Screen (.010 mm)
6- Type screen filter: #2 Sand
7- Type of seal: Bentonite seal, #2 Sand
a) Quantity used
8- Grout
a) Grout mix used: 1 bag Portland + 5 lbs bentonite per 8 gal water
b) Method of placement: Tremmie pipe
Development method: Pump/Surge
Development time: 1 hr
Estimated purge volume

CH2MHILL

PROJECT NUMBER	WELL NUMBER		
152962	IS28MW05	SHEET 1	OF 1

WELL COMPLETION DIAGRAM

PROJECT : Indian Head Site 28 Monitoring Well Installation
LOCATION : Indian Head, Maryland
DRILLING METHOD AND EQUIPMENT USED : 4.25-inch Hollow Stem Augers
DRILLING CONTRACTOR : Parratt Wolff START : 08/21/03 END : 08/21/03 GEOLOGIST : C. Brown



1- Ground elevation at well

2- Top of casing elevation

3- Wellhead protection cover type: Flush Mount
a) concrete pad dimensions: 2 X 2

4- Dia./type of inner well casing: 2" I.D. Sch 40 PVC

5- Type/slot size of screen: 2" PVC Screen (.010 mm)

6- Type screen filter: #2 Sand

7- Type of seal: Bentonite seal, #2 Sand
a) Quantity used

8- Grout
a) Grout mix used: 1 bag Portland + 5 lbs bentonite per 8 gal water
b) Method of placement: Tremmie pipe

Development method: Bailer

Development time: 1.5 hrs

Estimated purge volume: 6 gallons

Appendix E
Statistical Summaries of Analytical Results from Basewide Background Study

TABLE 4-2

SUMMARY OF DESCRIPTIVE STATISTICS FOR SURFACE SOILS
BACKGROUND INVESTIGATION REPORT FOR SOILS
INDIAN HEAD DIVISION
NSWC INDIAN HEAD, MARYLAND
PAGE 1 OF 2

Chemical	Cas Number	Frequency of Detection	Minimum Detection	Minimum Qualifier	Maximum Detection	Maximum Qualifier	Average of Positive Detections	Average of All Detections	Minimum Nondetect	Maximum Nondetect	Location of Maximum	Distribution of Data	95% Upper onfidence Lim	95% Upper Tolerance Limit	Eastern U.S. Soils [1]	Maryland Soils [2]	Residential Risk-Based Concentration [3]	Industrial Risk-Based Concentration [4]
Volatile Organic Compounds (ug/kg)																		
ACETONE	67-64-1	2/23	2200		13000	L	7800	660	1.9	23	RN65501701 01	UNDEFINED	13000	13000	NA	NA	7800000	200000000
CYCLOHEXANE	110-82-7	1/14	3.6	J	3.6	J	3.6	5.3	8.4	15	IS11S8420001	UNDEFINED	3.6	3.6	NA	NA	NA	NA
ETHYLBENZENE	100-41-4	1/23	2.4	J	2.4	J	2.4	5.0	1.5	16	IS11S8400001	UNDEFINED	2.4	2.4	NA	NA	7800000	200000000
GASOLINE RANGE ORGANICS	TTNUS003	2/5	0.1229		0.17		0.15	15	0.13	150	IS11S8420001	UNDEFINED	0.17	0.17	NA	NA	NA	NA
METHYL ACETATE	79-20-9	1/14	2.3	J	2.3	J	2.3	5.3	5.4	15	IS11S8390001	UNDEFINED	2.3	2.3	NA	NA	78000000	2000000000
STYRENE	100-42-5	1/23	1.3	J	1.3	J	1.3	8.2	0.34	15	BGDSS0120101-AVG	UNDEFINED	1.3	1.3	NA	NA	16000000	410000000
TOLUENE	108-88-3	3/23	32.5		140	J	81	15	1.9	15	IS11S8400001	UNDEFINED	140	140	NA	NA	16000000	410000000
TOTAL XYLENES	1330-20-7	3/15	1.7	J	9.9	J	5.6	6.4	0.78	17	IS11S8420001	UNDEFINED	9.9	9.9	NA	NA	160000000	4100000000
TRICHLOROFLUOROMETHANE	75-69-4	3/23	1.7	J	2.5	J	2.1	5.2	0.33	15	BGDSS0200101	UNDEFINED	2.5	2.5	NA	NA	23000000	610000000
Semivolatile Organic Compounds (ug/kg)																		
2-METHYLNAPHTHALENE	91-57-6	1/23	73	L	73	L	73	140	42	490	IS21SS200001	UNDEFINED	73	73	NA	NA	1600000	41000000
ACENAPHTHENE	83-32-9	1/23	140		140		140	160	38.7	490	BGDSS0160101	UNDEFINED	140	140	NA	NA	47000000	1200000000
ACETOPHENONE	98-86-2	3/23	46	J	64	J	58	140	62	490	IS11S8400001	UNDEFINED	64	64	NA	NA	78000000	2000000000
ANTHRACENE	120-12-7	1/23	260		260		260	160	26.2	490	BGDSS0160101	UNDEFINED	260	260	NA	NA	23000000	610000000
BENZALDEHYDE	100-52-7	1/20	59	J	59	J	59	160	130	490	IS21SS180001	UNDEFINED	59	59	NA	NA	78000000	2000000000
BENZO(A)ANTHRACENE	56-55-3	1/23	480		480		480	170	13.8	490	BGDSS0160101	UNDEFINED	480	480	NA	NA	870	7600
BENZO(A)PYRENE	50-32-8	1/23	390		390		390	170	16.9	490	BGDSS0160101	UNDEFINED	390	390	NA	NA	87	760
BENZO(B)FLUORANTHENE	205-99-2	1/23	420		420		420	170	35	490	BGDSS0160101	UNDEFINED	420	420	NA	NA	870	7800
BENZO(G,H,I)PERYLENE[5]	191-24-2	1/23	130		130		130	160	45	490	BGDSS0160101	UNDEFINED	130	130	NA	NA	2300000	61000000
BENZO(K)FLUORANTHENE	207-08-9	1/23	360	J	360	J	360	170	41.6	490	BGDSS0160101	UNDEFINED	360	360	NA	NA	8700	78000
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	8/23	51	J	7500	J	1100	470	58	490	BGDSSQ200101	UNDEFINED	7500	7500	NA	NA	46000	410000
CARBAZOLE	86-74-8	1/20	130	J	130	J	130	160	35	490	BGDSS0160101	UNDEFINED	130	130	NA	NA	32000	290000
CHRYSENE	218-01-9	1/23	440		440		440	170	21	490	BGDSS0160101	UNDEFINED	440	440	NA	NA	87000	780000
DIBENZOFURAN	132-64-9	1/23	65	J	65	J	65	150	28.7	490	BGDSS0160101	UNDEFINED	65	65	NA	NA	310000	8200000
FLUORANTHENE	206-44-0	2/23	65	J	1100		580	190	35	490	BGDSS0160101	UNDEFINED	1100	1100	NA	NA	31000000	82000000
FLUORENE	86-73-7	1/23	150		150		150	160	27.1	490	BGDSS0160101	UNDEFINED	150	150	NA	NA	31000000	82000000
INDENO(1,2,3-CD)PYRENE	193-39-5	1/23	100		100		100	160	46.4	490	BGDSS0160101	UNDEFINED	100	100	NA	NA	870	7800
NAPHTHALENE	91-20-3	1/23	110	L	110	L	110	150	34.5	490	IS21SS200001	UNDEFINED	110	110	NA	NA	1600000	41000000
PHENANTHRENE[5]	85-01-8	1/23	1100		1100		1100	200	35	490	BGDSS0160101	UNDEFINED	1100	1100	NA	NA	23000000	610000000
PYRENE	129-00-0	2/23	120	J	880		500	160	35	490	BGDSS0160101	UNDEFINED	880	880	NA	NA	2300000	61000000
Explosives (ug/kg)																		
2-NITROTOLUENE	88-72-2	1/9	150	J	150	J	150	110	81.4	250	IS11S8400001	UNDEFINED	150	150	NA	NA	780000	20000000
4-NITROTOLUENE	99-99-0	1/9	210	J	210	J	210	120	87.2	250	IS11S8400001	UNDEFINED	210	210	NA	NA	780000	20000000
Pesticides/PCBs (ug/kg)																		
4,4'-DDE	72-55-9	6/20	0.73	J	10	J	2.2	1.6	1.4	4.1	BGDSS0080101	UNDEFINED	10	10	NA	NA	1900	17000
4,4'-DDT	50-29-3	4/19	0.38	J	9.4	J	3.1	2.2	2.328	4.6	BGDSS0080101	UNDEFINED	9.4	9.4	NA	NA	1900	17000
Inorganics (mg/kg)																		
ALUMINUM	7429-90-5	32/32	2010		15500	J	7540	7540	NA	NA	BGDSS0150101	LOGNORMAL	9000	16700	7000 - > 100000	NA	78000	2000000
ARSENIC	7440-38-2	30/34	0.78		18.3		4.3	4.0	1.8	3.6	BGDSS0190101	LOGNORMAL	6.2	14.9	<0.1 - 73	1.1 - 7.3	0.45	3.8
BARIUM	7440-39-3	34/34	12.5		84.8		42.5	42.5	NA	NA	S26-MW03-001	NORMAL	47.6	80.4	10 - 1500	150 - 700	5500	140000
BERYLLIUM	7440-41-7	24/34	0.05	J	1.1		0.44	0.33	0.047	0.53	BGDSS0120101-AVG	UNDEFINED	1.1	1.1	<1 - 7	ND - 3	160	4100
CADMIUM	7440-43-9	12/34	0.12	J	2.6		0.4	0.2	0.06	0.67	IS21SS190001	UNDEFINED	2.5	2.6	NA	<0.01 - 5.8	78	8200
CALCIUM	7440-70-2	22/32	63.9	J	2420		504	369	98.8	275	IS13SS100001	LOGNORMAL	573	9065	100 - 280000	NA	NA	NA
CHROMIUM	7440-47-3	34/34	3.5	K	26.9	L	13.6	13.6	NA	NA	IS13SS100001	LOGNORMAL	18.9	33.4	1 - 1000	15 - 150	230	6100
COBALT	7440-48-4	34/34	0.58		18		5.4	5.4	NA	NA	S26-MW03-001	LOGNORMAL	7.5	22.3	<0.3 - 70	ND - 20	1600	41000
COPPER	7440-50-8	32/34	1.8		19.4		8.7	6.5	4.8	4.8	BGDSS0120101-AVG	LOGNORMAL	8.0	20.3	<1 - 700	5 - 70	3100	82000
CYANIDE	57-12-5	4/10	0.59		0.73		0.68	0.42	0.073	1.1	IS21SS190001	UNDEFINED	0.73	0.73	NA	NA	1600	41000
IRON	7439-89-6	32/32	2770		31600	J	13000	13000	NA	NA	BGDSS0120101-AVG	LOGNORMAL	16000	36500	100 - > 100000	NA	23000	610000
LEAD	7439-92-1	32/34	3.5	J	148		18.7	17.9	9.4	10	BGDSS0080101	LOGNORMAL	21.7	62.5	<10 - 300	10 - 80	400[7]	750[7]
MAGNESIUM	7439-95-4	32/32	143	K	1990		604	604	NA	NA	IS13SS100001	LOGNORMAL	722	1820	50 - 50000	NA	NA	NA
MANGANESE	7439-96-5	32/32	17.4		682	J	227	227	NA	NA	S26-MW03-001	LOGNORMAL	388	1360	<2 - 7000	NA	1800	41000
MERCURY	7439-97-6	22/34	0.03		0.13	L	0.06	0.05	0.02	0.077	BGDSS0150101	LOGNORMAL	0.080	0.16	0.01 - 3.4	0.04 - 0.16	23	610
NICKEL	7440-02-0	34/34	1.7		14		5.4	5.4	NA	NA	IS11SS410001-AVG	LOGNORMAL	6.8	13.4	<5 - 700	ND - 30	1600	41000
POTASSIUM	09/07/40	32/32	126		2620		497	497	NA	NA	IS13SS100001	LOGNORMAL	687	1470	50 - 37000	NA	NA	NA
SELENIUM	7782-49-2	14/34	0.188	L	1.2		0.67	0.54	0.16	1.9	IS11SS400001	NORMAL	0.82	1.8	<0.1 - 3.9	<0.1 - 0.8	390	10000
SILVER	7440-22-4	9/34	0.27	L	0.84		0.6	0.29	0.06	0.82	IS11SS400001	UNDEFINED	0.84	0.84	NA	NA	390	10000
SODIUM	7440-23-5	13/32	38.5		120		84.2	65.6	19.2	407	IS11SS400001	UNDEFINED	120	120	<500 - 65000	NA	NA	NA
THALLIUM	7440-28-0	7/34	1.2		2.3	L	1.5	0.62	0.22	3	BGDSS0160101	UNDEFINED	2.3	2.3	NA	NA	5.3	140
VANADIUM	7440-62-2	34/34	9.63	L	63.7		23.3	23.3	NA	NA	BGDSS0150101	LOGNORMAL	26.7	53.3	<7 - 300	20 - 150	550	14000
ZINC	7440-66-6	34/34	8.2		42.95	J	20.2	20.2	NA	NA	BGDSS0120101-AVG	NORMAL	23.6	37.5	<6 - 2900	8 - 112	23000	610000
Miscellaneous (mg/kg)																		
AMMONIA	7664-41-7	2/2	31.9		49.9		35.9	35.9	NA	NA	S26-MW03-001	UNDEFINED	—	—	NA	NA	NA	NA
DIESEL RANGE ORGANICS	TTNUS004	4/5	4.3		47		18.4	15.1	4	4	IS11S8400001	LOGNORMAL	47.0	1350	NA	NA	NA	NA
NITRITE/NITRATE	TTNUS029	1/2	1.9		1.9		1.9	1.9	1.8	1.8	S26-MW03-001	UNDEFINED	—	—	NA	NA	NA	NA
PH (S.U.)	TTNUS003	7/7	4.5		7		6.3	6.3	NA	NA	IS13SS100001	LOGNORMAL	6.9	6.9	NA	NA	NA	NA
TOTAL ORGANIC CARBON	TTNUS009	29/29	1410	J	40100		10600	10600	NA	NA	IS11S8420001	LOGNORMAL	16800	57200	NA	NA	NA	NA
TOTAL PETROLEUM HYDROCARBONS	TTNUS001	1/1	33.7	L	33.7	L	33.7	33.7	NA	NA	S26-MW03-001	UNDEFINED	—	—	NA	NA	NA	NA
TOTAL SOLIDS (%)	TTNUS046	7/7	66		79.2		75.4	75.4	NA	NA	IS21SS190001	UNDEFINED	79.2	79.2	NA	NA	NA	NA

TABLE 4-2

SUMMARY OF DESCRIPTIVE STATISTICS FOR SURFACE SOILS
BACKGROUND INVESTIGATION REPORT FOR SOILS
INDIAN HEAD DIVISION
NSWC INDIAN HEAD, MARYLAND
PAGE 2 OF 2

1 - Shacklette, Hansford T. and Josephine G. Boerngen, Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States, U.S. Geological Survey Professional Paper 1270, 1984 (surface soil values are presented in table)
2 - Dragun, James, Ph.D., Elements in North American Soils. HWCRI, Green Belt, MD, 1991 (surface soil values are presented in table)
3 - EPA Region III Risk-Based Concentrations, October, 2002.
4 - EPA Region 9 PRGs Table, October, 2002.
5 - Pyrene is used as a surrogate for Benzo(g,h,i)perylene, and Phenanthrene.
Bolded values represent exceedences of Region III RBC's or background concentrations reported in literature background references
NA - Not available
J Positive detection is qualified as an estimate.
K Positive detection is qualified as biased high.
L Positive result is qualified as biased low.
--- Upper confidence and tolerance limits cannot be calculated because of the size of the data set.
NA - Not available

TABLE 4-4

SUMMARY OF DESCRIPTIVE STATISTICS FOR NON-CLAY-LIKE SUBSURFACE SOILS
BACKGROUND INVESTIGATION REPORT FOR SOILS
INDIAN HEAD DIVISION
NSWC INDIAN HEAD, MARYLAND

Chemical	Cas Number	Frequency of Detection	Minimum Detection	Minimum Qualifier	Maximum Detection	Maximum Qualifier	Average of Positive Detections	Average of All Detections	Minimum Nondetect	Maximum Nondetect	Location of Maximum	Distribution of Data	95% Upper Confidence Limit	95% Upper Tolerance Limit	Eastern U.S. Soils [1]	Maryland Soils [2]	Residential Risk-Based Concentration [3]	Industrial Risk-Based Concentration [3]
Volatile Organic Compounds (ug/kg)																		
ACETONE	67-64-1	1/10	1600		1600		1600	180	2.6	13	RFL850030101	UNDEFINED	1600	1600	NA	NA	7800000	200000000
TOLUENE	108-88-3	1/10	3.3	J	3.3	J	3.3	4.2	5	13	IS11S8230203	UNDEFINED	3.3	3.3	NA	NA	16000000	410000000
TOTAL XYLENES	1330-20-7	1/5	9	J	9	J	9.0	8.6	12	17	IS11S8240203	NORMAL	9.1	13	NA	NA	160000000	4100000000
TRICHLOROFLUOROMETHANE	75-69-4	2/10	1.6	J	2	J	1.9	4.5	5	13	SGDSB0200101	UNDEFINED	2.0	2.0	NA	NA	23000000	610000000
Semivolatile Organic Compounds (ug/kg)																		
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	3/10	57	J	79	J	69	110	75	380	SGDSB0190101	UNDEFINED	79	79	NA	NA	46000	410000
Pesticides/PCBs (ug/kg)																		
4,4'-DDE	72-55-9	4/12	0.24	J	2.9	J	1.1	1.2	1.4	3.9	SGDSB0090101	LOGNORMAL	2.3	7.7	NA	NA	1900	17000
4,4'-DDT	50-29-3	2/12	0.58	J	2.4	J	1.5	1.9	1.9	4.75	SGDSB0090101	UNDEFINED	2.4	2.4	NA	NA	1900	17000
Inorganics (mg/kg)																		
ALUMINUM	7429-90-5	15/15	3070	J	18900		9260	9260	NA	NA	SGDSB0010101	NORMAL	11400	21400	7000 - > 100000	NA	78000	2000000
ARSENIC	7440-38-2	14/17	1.8		9.2		4.5	3.8	0.76	1.9	SGDSB0120101	LOGNORMAL	7.9	29.7	<0.1 - 73	1.1 - 7.1	0.43	3.8
BARIUM	7440-39-3	17/17	9.07		56.3	J	30.3	30.3	NA	NA	SGDSB0080101	NORMAL	34.8	64.5	10 - 1500	150 - 700	5500	140000
BERYLLIUM	7440-41-7	15/17	0.12		0.91		0.37	0.34	0.14	0.28	SGDSB0120101	LOGNORMAL	0.51	1.8	<1 - 7	ND - 5	160	4100
CADMIUM	7440-43-9	7/17	0.095		0.37	R	0.16	0.13	0.06	0.511	SGDSB0080101	LOGNORMAL	0.20	0.61	NA	<0.01 - 6.5	78	2000
CALCIUM	7440-70-2	9/15	76.4	J	783	J	376	186	91	248.5	SGDSB0140101	LOGNORMAL	359	1270	100 - 880000	NA	NA	NA
CHROMIUM	7440-47-3	17/17	6.2		44.7	J	18.0	18.0	NA	NA	SGDSB0080101-AVG	LOGNORMAL	23.7	69.1	1 - 1000	15 - 100	290	6100
COBALT	7440-48-4	17/17	0.845	L	7.2		3.2	3.2	NA	NA	SGDSB0120101	LOGNORMAL	4.0	14.7	<0.3 - 70	ND - 20	1900	41000
COPPER	7440-50-8	15/17	1.6		23.1		8.5	7.5	1.53	4.5	SGDSB0120101	LOGNORMAL	13.8	47.6	<1 - 700	5 - 70	3100	82000
CYANIDE	57-12-5	2/3	0.59		0.59		0.59	0.56	1.02	1.02	IS11S8240200	UNDEFINED	0.59	0.59	NA	NA	1600	41000
IRON	7439-89-6	15/15	4030	J	31700	J	18200	18200	NA	NA	SGDSB0140101	NORMAL	18600	35200	100 - > 100000	NA	23000	610000
LEAD	7439-92-1	16/17	3.1		26.5		9.8	9.3	5.3	5.3	SGDSB0060101	LOGNORMAL	13.5	36.5	<10 - 300	10 - 50	400*	750*
MAGNESIUM	7439-95-4	15/15	218	J	1720	J	741	741	NA	NA	SGDSB0120101	LOGNORMAL	1079	2940	50 - 50000	NA	NA	NA
MANGANESE	7439-96-5	15/15	16.2	J	120		52.2	52.2	NA	NA	IS11S8270203	NORMAL	78.7	159	<2 - 7000	NA	1600	41000
MERCURY	7439-97-6	11/17	0.01		0.08	L	0.04	0.03	0.03	0.059	SGDSB0140101	LOGNORMAL	0.048	0.14	0.01 - 3.4	0.04 - 0.14	23	610
NICKEL	7440-02-0	17/17	1.8		13.2		6.4	6.4	NA	NA	SGDSB0120101	LOGNORMAL	8.8	18.9	<5 - 700	ND - 30	1600	41000
POTASSIUM	09/07/40	15/15	237		2640	J	770	770	NA	NA	SGDSB0060101-AVG	LOGNORMAL	1140	3440	50 - 37000	NA	NA	NA
SELENIUM	7782-49-2	9/17	0.295	L	2.7	L	0.9	0.89	0.153	1	SGDSB0190101	LOGNORMAL	1.1	3.8	<0.1 - 3.9	<0.1 - 0.5	390	10000
SILVER	7440-22-4	6/17	0.63		1.1	U	0.79	0.89	0.06	0.4	SGDSB0190101	UNDEFINED	1.1	1.1	NA	NA	390	10000
SODIUM	7440-23-5	9/15	44.5		232		90.3	83.9	18.4	80.7	SGDSB0060101-AVG	LOGNORMAL	128	451	<500 - 56000	NA	NA	NA
THALLIUM	7440-28-0	6/17	0.48		2.9	L	1.3	0.87	0.225	1.2	SGDSB0190101	LOGNORMAL	1.1	4.1	NA	NA	5.5	140
VANADIUM	7440-62-2	17/17	9.78	L	61.9		27.9	27.9	NA	NA	SGDSB0140101	LOGNORMAL	39.6	102	<7 - 300	20 - 150	510	14000
ZINC	7440-66-6	17/17	7.3	J	48.9	J	17.6	17.6	NA	NA	SGDSB0120101	LOGNORMAL	22.9	49.7	<5 - 2900	9 - 113	23000	610000
Miscellaneous (mg/kg)																		
AMMONIA	7664-41-7	1/1	7.8		7.8		7.8	7.8	NA	NA	S28-MW53-002	UNDEFINED	7.8	7.8	NA	NA	NA	NA
TOTAL ORGANIC CARBON	TTNUS003	12/13	354	J	8200		2680	2660	87.5	87.5	SGDSB0190101	LOGNORMAL	17900	64300	NA	NA	NA	NA

1 - Shacklette, Hansford T. and Josephine G. Boerngen, Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States. U.S. Geological Survey Professional Paper 1270, 1984 (surface soil values are presented in table)
2 - Dragun, James, Ph.D., Elements in North American Soils. HMCRI, Green Belt, MD, 1991 (surface soil values are presented in table)
3 - EPA Region III Risk-Based Concentrations, October, 2002.
4 - EPA Region 9 PRGs Table, October, 2002.
Bolded values represent exceedances of Region III RBC's or background concentrations reported in literature background references
NA - Not available
J Positive detection is qualified as an estimate.
K Positive detection is qualified as biased high.
L Positive result is qualified as biased low.
NA - Not available

TABLE A-6

STATISTICAL SUMMARY OF ANALYTICAL RESULTS FOR NON-TURBID UNFILTERED GROUNDWATER SAMPLES
BACKGROUND INVESTIGATION REPORT
INDIAN HEAD DIVISION
NSWC INDIAN HEAD, MARYLAND

Chemical	Frequency of Detection	Minimum Detection	Maximum Detection	Average of Positive Detections	Location of Maximum	Distribution of Data	95% Upper Confidence Limit	95% Upper Tolerance Limit	Federal Maximum Contaminant Level[1]	Risk-Based Concentration[2]
Volatile Organic Compounds (ug/L)										
Carbon disulfide	1/2	6	6	6	RPLMW001U001	Undefined	6	6	NA	1000
Chloroform	1/2	2	2	2	RPLMW001U001	Undefined	2	2	100/80[3]	0.15
Toluene	1/2	7	7	7	RPLMW001U001	Undefined	7	7	1000	750
Semivolatile Organic Compounds (ug/L)										
Bis(2-Ethylhexyl)phthalate	1/2	1	1	1	RPLMW001U001	Undefined	1	1	6	4.8
Di-N-butyl phthalate	1/2	1	1	1	RPLMW001U001	Undefined	1	1	NA	3700
Diethyl phthalate	1/2	3	3	3	RPLMW001U001	Undefined	3	3	NA	29000
Energetics (ug/L)										
RDX	1/1	1.2	1.2	1.2	RN3MW001U001	Undefined	1.2	1.2	NA	0.61
Inorganics (ug/L)										
Aluminum	3/4	71	9620	3607	BGDMW004U001	Lognormal	9620	286645198	50-200[4]	37000
Barium	6/6	12.9	139	64	BGDMW004U001	Lognormal	139	254	2000	2600
Cadmium	1/6	2.8	2.8	2.8	BGDMW001U001	Undefined	2.8	2.8	5	18
Calcium	4/4	2340	18100	7402.5	BGDMW001U001	Lognormal	18100	599450	NA	NA
Chromium	3/6	2.8	16.4	7.7	BGDMW004U001	Lognormal	16.4	20.9	100	110
Cobalt	5/6	2.1	15.6	6.48	BGDMW004U001	Lognormal	15.6	39.6	NA	730
Copper	2/6	4.4	22.4	13.4	BGDMW004U001	Undefined	22.4	22.4	1300[4]	1500
Iron	4/4	156	19900	9846.5	BGDMW004U001	Normal	19900	57199	300[3]	11000
Magnesium	4/4	1250	3960	2157.5	BGDMW002U001	Lognormal	3960	31254	NA	NA
Manganese	4/4	184	924	354.5	BGDMW002U001	Lognormal	924	28160	50[3]	730
Mercury	1/6	0.13	0.13	0.13	RPLMW001U001	Undefined	0.13	0.13	2	11
Nickel	4/6	2.8	16.8	7.65	BGDMW004U001	Lognormal	16.8	39.0	NA	730
Potassium	4/4	1340	6040	2745	BGDMW003U001	Lognormal	6040	83089	NA	NA
Sodium	4/4	3580	33200	18995	BGDMW002U001	Normal	31307	79585	NA	NA
Vanadium	1/6	20.9	20.9	20.9	BGDMW004U001	Lognormal	20.9	24.1	NA	260
Zinc	1/6	45.2	45.2	45.2	BGDMW004U001	Undefined	45.2	45.2	5000[3]	11000
Miscellaneous (mg/l)										
Chloride	4/4	4.3	40.1	19.3	BGDMW002U001	Lognormal	40.1	1843	250[3]	NA
Nitrate (ug/l)	4/4	0.05	0.40	0.155	BGDMW003U001	Lognormal	0.40	11.8	10000	58000
Sulfate	4/4	9.3	23.6	16.9	BGDMW001U001	Normal	23.6	47.0	250[3]	NA
Total Organic Carbon	5/5	1.11	6.9	3.44	BGDMW004U001	Lognormal	6.9	45.0	NA	NA

Notes:
1 - Drinking Water Regulations and Health Advisories, www.epa.gov/safewater, July, 2002.
2 - EPA Region III Risk-Based Concentrations, October, 2002. Values presented are tap water values.
3 - Secondary Maximum Contaminant Level (SMCL), Drinking Water Regulations and Health Advisories, EPA 822-B-96-002, Summer, 2002.
4 - Action Level, Drinking Water Regulations and Health Advisories, www.epa.gov/safewater, July, 2002.
Value is bolded which exceeds Region III RBCs or MCLs.
NA - Not available

Appendix F
Statistical Comparison of RI Inorganic Analytical Results to Background Results

Appendix F Table
Inorganic Statistics
Site 28 RI Report
NDWIH
Indian Head, Maryland

Media	Analyte	Number of Detections	Maximum Concentration	Mean Concentration	Background 95% UCL	Background Mean
Surface Soil	Aluminum	35/35	13100	5765.4	9,000	7,540
	Antimony	5/19	18.3	1.6	ND	ND
	Arsenic	35/35	377	77.8	5.2	4.0
	Barium	35/35	1550	152.6	47.6	42.5
	Beryllium	3/35	1.2	0.2	1.1	0.33
	Cadmium	25/35	141	15.7	2.5	0.2
	Calcium	35/35	23500	2747.7	573	369
	Chromium	35/35	169	19.2	15.9	13.6
	Cobalt	35/35	13.2	4.7	7.5	5.4
	Copper	35/35	1270	118.6	8.0	6.5
	Iron	35/35	84600	19084.3	16,000	13,000
	Lead	35/35	10300	790.7	21.7	17.9
	Magnesium	35/35	2580	759.3	722	604
	Manganese	35/35	411	201.9	388	227
	Mercury	16/35	11.5	0.6	0.06	0.05
	Nickel	26/35	44.1	10.5	6.6	5.4
	Potassium	30/35	1310	446.7	597	497
	Selenium	9/35	1.3	0.4	0.62	0.54
	Silver	9/35	16.1	1.7	0.84	0.29
	Sodium	3/35	112	27.7	120	65.6
	Vanadium	35/35	70.4	23.3	26.7	23.3
	Zinc	35/35	71900	9408.1	23.6	20.2

Media	Analyte	Number of Detections	Maximum Concentration	Mean Concentration	Background 95% UCL	Background Mean
Subsurface Soil	Aluminum	35/35	15000	5438.3	11,400	9,260
	Antimony	1/10	101	15.0	ND	ND
	Arsenic	33/35	324	22.0	7.9	3.8
	Barium	35/35	3670	139.3	36.6	30.5
	Beryllium	4/35	1.4	0.4	0.51	0.34
	Cadmium	11/35	125	9.4	0.2	0.13
	Calcium	35/35	22400	1054.5	353	186
	Chromium	34/35	176	13.9	23.7	18.0
	Cobalt	28/35	19.2	4.7	4.9	3.2
	Copper	31/35	2300	82.8	13.8	7.5
	Iron	35/35	130000	14870.0	18,800	15,200
	Lead	35/35	16600	616.8	13.5	9.3
	Magnesium	35/35	23300	1230.3	1,070	741
	Manganese	35/35	1060	81.4	79	62.2
	Mercury	4/35	0.36	0.1	0.048	0.03
	Nickel	22/35	251	16.0	6.9	5.4
	Potassium	30/35	6140	585.3	1,140	770
	Selenium	3/35	0.52	1.0	1.1	0.59
	Silver	6/35	6.7	2.0	1.1	0.29
	Sodium	5/35	164	53.0	128	63.9
	Thallium	1/35	0.87	1.7	1.1	0.57
	Vanadium	35/35	92.5	21.8	38.8	27.9
	Zinc	35/35	51100	3932.4	22.2	17.6

All Concentrations reported in milligrams per kilograms (mg/kg)

Notes: ND = Not detected

= Exceeds 95% UCL

Appendix F Table
Inorganic Statistics
Site 28 RI Report
NDWIH
Indian Head, Maryland

Media	Analyte	Number of Detections	Maximum Concentration	Mean Concentration	Background 95% UCL	Background Mean
Groundwater	Aluminum	4/4	19300	8240.8	9,620	3,607
	Antimony	1/4	2.1	45.5	ND	ND
	Arsenic	3/4	342	124.8	ND	ND
	Barium	4/4	241	118.2	139	64
	Beryllium	3/4	2.4	2.1	ND	ND
	Cadmium	1/4	3.3	2.4	2.8	2.8
	Calcium	4/4	10600	6917.5	18,100	7,403
	Chromium	4/4	27.4	13.7	16.4	7.7
	Cobalt	3/4	59.8	26.5	15.6	6.48
	Copper	4/4	50.8	33.4	22.4	13.4
	Iron	4/4	36400	14895.0	19,900	9,847
	Lead	4/4	29.9	14.0	ND	ND
	Magnesium	4/4	9690	6040.0	3,980	2,158
	Manganese	4/4	601	364.8	824	355
	Mercury	0/4	NA	0.1	0.13	0.13
	Nickel	3/4	12.9	15.1	16.6	7.65
	Potassium	3/4	6290	4115.0	6,040	2,745
	Selenium	0/4	NA	4.2	ND	ND
	Silver	0/4	NA	10.0	ND	ND
	Sodium	4/4	25000	19725.0	31,307	16,995
	Thallium	0/4	NA	5.4	ND	ND
	Vanadium	3/4	61.8	36.3	20.9	20.9
	Zinc	4/4	1620	812.8	45.2	45.2

GW concentrations are reported in micrograms per liter (ug/L)

Notes: ND = Not detected

= Exceeds 95% UCL

Appendix G
Human Health Risk Assessment Tables

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

Site 28, IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Soil*	Soil*	Site 28 Soil*	Utility Worker	Adult	Dermal	On-site	Quant	Utility workers could contact surface and subsurface soil while performing activities at the site.
						Ingestion	On-site	Quant	Utility workers could contact surface and subsurface soil while performing activities at the site.
		Air	Emissions from Site 28 Soil*	Utility Worker	Adult	Inhalation	On-site	Quant	Utility workers may inhale vapors and dust from surface and subsurface soil while working at site.
	Surface Soil	Surface Soil	Site 28 Surface Soil	Trespasser	Adult	Dermal Absorption	On-site	Quant	Nearby residents may trespass on site and contact surface soil.
						Ingestion	On-site	Quant	Nearby residents may trespass on site and contact surface soil.
					Adolescents	Dermal Absorption	On-site	Quant	Nearby residents may trespass on site and contact surface soil.
						Ingestion	On-site	Quant	Nearby residents may trespass on site and contact surface soil.
		Air	Emissions from Site 28 Surface Soil	Trespasser	Adult	Inhalation	On-site	Quant	Nearby residents may trespass on site and inhale vapors and dust from surface soil.
					Adolescent	Inhalation	On-site	Quant	Nearby residents may trespass on site and inhale vapors and dust from surface soil.
Current/Future	Sediment	Sediment	Mattawoman Creek	Recreation	Adult	Dermal	On-site	None	Not considered a complete pathway because recreational users are considered to be offshore in deep water and would not have contact with sediment.
						Ingestion	On-site	None	Not considered a complete pathway because recreational users are considered to be offshore in deep water and would not have contact with sediment.
					Adolescent	Dermal	On-site	None	Not considered a complete pathway because recreational users are considered to be offshore in deep water and would not have contact with sediment.
						Ingestion	On-site	None	Not considered a complete pathway because recreational users are considered to be offshore in deep water and would not have contact with sediment.
		Fish	Mattawoman Creek	Recreational	Adult	Ingestion	On-site	Qual	Recreational user may ingest fish caught from Mattawoman Creek.
					Adolescent	Ingestion	On-site	Qual	Recreational user may ingest fish caught from Mattawoman Creek.
	Surface Water	Surface Water	Mattawoman Creek	Recreation	Adult	Dermal	On-site	Quant	Recreational user may come into contact with surface water while boating in Mattawoman Creek.
						Ingestion	On-site	Quant	Recreational user may come into contact with surface water while boating in Mattawoman Creek.
					Adolescent	Dermal	On-site	Quant	Recreational user may come into contact with surface water while boating in Mattawoman Creek.
						Ingestion	On-site	Quant	Recreational user may come into contact with surface water while boating in Mattawoman Creek.

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

Site 28, IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Soil*	Soil*	Site 28 Soil*	Resident	Adult	Dermal Absorption	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
						Ingestion	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
					Child	Dermal Absorption	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
						Ingestion	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
					Child/Adult	Dermal Absorption	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
						Ingestion	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
				Construction Worker	Adult	Dermal Absorption	On-site	Quant	Construction worker may be exposed to soil during excavation activities.
						Ingestion	On-site	Quant	Construction worker may be exposed to soil during excavation activities.
				Trespasser	Adolescent	Dermal Absorption	On-site	Quant	Trespasser/visitor may come into contact with soil at the site.
						Ingestion	On-site	Quant	Trespasser/visitor may come into contact with soil at the site.
					Adult	Dermal Absorption	On-site	Quant	Trespasser/visitor may come into contact with soil at the site.
						Ingestion	On-site	Quant	Trespasser/visitor may come into contact with soil at the site.
		Air	Emissions from Site 28 Soil*	Resident	Adult	Inhalation	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
					Child	Inhalation	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
					Child/Adult	Inhalation	On-site	Quant	The site is not expected to be developed for residential use; however, the residential scenario is conservatively included in this evaluation.
				Construction Worker	Adult	Inhalation	On-site	Quant	Construction workers may inhale vapors or fugitive dust from soil during excavation activities.
				Trespasser	Adolescent	Inhalation	On-site	Quant	Trespassers/visitors may be exposed to vapors or fugitive dust from site 28 soils.
					Adult	Inhalation	On-site	Quant	Trespassers/visitors may be exposed to vapors or fugitive dust from site 28 soils.

TABLE 1

SELECTION OF EXPOSURE PATHWAYS

Site 28, IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site/ Off-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Groundwater	Groundwater	Tap Water	Resident	Adult	Ingestion	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
						Dermal Absorption	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply. The adult is assumed to shower, and the child is assumed to bathe.
					Child	Ingestion	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
						Dermal Absorption	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
					Child/Adult	Ingestion	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply. This is for cancer risk only.
						Dermal Absorption	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
			Water in Excavation Pit	Construction Worker	Adult	Ingestion	On-site	None	Construction worker not expected to ingest significant amount of groundwater during excavation activities.
						Dermal Absorption	On-site	Quant	Construction woker may contact groundwater during excavation activites.
		Air	Water Vapors at Showerhead	Resident	Adult	Inhalation	On-site	Quant	Although unlikely, groundwater may be used as future potable water supply.
		Air	Volatilization from Water In Excavation Pit	Construction Worker	Adult	Inhalation	On-site	Quant	Construction worker may be exposed during construction activities.

* Surface soil and subsurface soil combined.

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Remedial Investigation Report Site 28

IHDIV-NSWC

Scenario Timeframe: Current
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Site 28 Soil*	540-59-0	1,2-Dichloroethene (total)	1.0E-03 L	3.0E-03 L	MG/KG	IS28SS33-0001	11/30	0.01 - 0.026	3.0E-03	NA	7.0E+01 N	3.7E-03	SSL	NO	BSL
	78-93-3	2-Bulanone	4.0E-03 J	9.0E-03 J	MG/KG	IS28SB38-0103	2/70	0.01 - 0.026	9.0E-03	NA	4.7E+03 N	2.9E+00	SSL	NO	BSL
	67-64-1	Acetone	1.3E-02 J	3.1E-02	MG/KG	IS28SB08-0103	2/70	0.01 - 0.026	3.1E-02	1.8E+03	7.8E+02 N	2.2E+00	SSL	NO	BSL
	98-82-8	Cumene	7.0E-03 J	7.0E-03 J	MG/KG	IS28SS41-0001	1/70	0.01 - 0.026	7.0E-03	NA	7.8E+02 N	6.4E+00	SSL	NO	BSL
	100-41-4	Ethylbenzene	2.0E-03 J	2.0E-03 J	MG/KG	IS28SB32-0103	1/70	0.01 - 0.026	2.0E-03	NA	7.8E+02 N	1.5E+00	SSL	NO	BSL
	79-20-9	Methyl acetate	6.0E-03 J	6.0E-03 J	MG/KG	IS28SB32-0103 IS28SS37-0001	2/70	0.01 - 0.026	6.0E-03	NA	7.8E+03 N	2.5E+00	SSL	NO	BSL
	1634-04-4	Methyl-tert-butyl ether (MTBE)	4.0E-04 J	1.1E-02 L	MG/KG	IS28SS33-0001 IS28SB04-0103	36/70	0.01 - 0.026	1.1E-02	NA	1.6E+02 C	1.2E-02	SSL	NO	BSL
	75-09-2	Methylene chloride	1.0E-03 J	1.0E-03 J	MG/KG	IS28SB08-0103	1/70	0.01 - 0.026	1.0E-03	NA	8.5E+01 C	1.9E-02	SSL	NO	BSL
	100-42-5	Styrene	9.0E-03 J	9.0E-03 J	MG/KG	IS28SS27-0001	1/70	0.01 - 0.026	9.0E-03	NA	1.6E+03 N	5.7E+00	SSL	NO	BSL
	79-01-6	Trichloroethene	2.0E-02	2.0E-02	MG/KG	IS28SB20-0103 IS28SS40-0001P	1/70	0.01 - 0.026	2.0E-02	NA	1.6E+00 C	2.6E-04	SSL	NO	BSL
	1330-20-7	Xylene, total	2.0E-03 J	2.0E-03 J	MG/KG	IS28SS21-0001P	1/70	0.01 - 0.026	2.0E-03	NA	1.6E+03 N	3.0E-01	SSL	NO	BSL
	156-59-2	cis-1,2-Dichloroethene	1.0E-03 L	3.0E-03 L	MG/KG	IS28SS33-0001	11/70	0.01 - 0.026	3.0E-03	NA	7.8E+01 N	3.5E-03	SSL	NO	BSL
	92-52-4	1,1-Biphenyl	1.2E-01 J	1.2E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.2E-01	NA	3.9E+02 N	9.6E+00	SSL	NO	BSL
	95-95-4	2,4,5-Trichlorophenol	1.3E-01 J	1.3E-01 J	MG/KG	IS28SS36-0001	1/70	0.88 - 6	1.3E-01	NA	7.8E+02 N	N/A	N/A	NO	BSL
	88-06-2	2,4,6-Trichlorophenol	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.0E-01	NA	5.8E+01 C	N/A	N/A	NO	BSL
	120-83-2	2,4-Dichlorophenol	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.0E-01	NA	2.3E+01 N	1.2E-01	SSL	NO	BSL
	105-67-9	2,4-Dimethylphenol	7.7E-02 J	7.7E-02 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	7.7E-02	NA	1.6E+02 N	6.7E-01	SSL	NO	BSL
	121-14-2	2,4-Dinitrotoluene	1.0E-01 J	1.2E+00 J	MG/KG	IS28SS10-0001	4/70	0.35 - 2.4	1.2E+00	NA	1.6E+01 N	5.7E-03	SSL	NO	BSL
	606-20-2	2,6-Dinitrotoluene	1.1E-01 J	1.1E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.1E-01	NA	7.8E+00 N	2.5E-03	SSL	NO	BSL
	91-58-7	2-Chloronaphthalene	1.1E-01 J	1.1E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.1E-01	NA	6.3E+02 N	2.0E+00	SSL	NO	BSL
	95-57-8	2-Chlorophenol	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.0E-01	NA	3.9E+01 N	N/A	N/A	NO	BSL
	91-57-6	2-Methylnaphthalene	3.2E-02 J	1.5E-01 J	MG/KG	IS28SS36-0001	2/70	0.35 - 2.4	1.5E-01	NA	1.6E+02 N	N/A	N/A	NO	BSL
	95-48-7	2-Methylphenol	8.6E-02 J	8.6E-02 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	8.6E-02	NA	3.9E+02 N	N/A	N/A	NO	BSL
	88-74-4	2-Nitroaniline	6.4E-02 J	6.4E-02 J	MG/KG	IS28SS36-0001	1/70	0.88 - 6	6.4E-02	NA	2.3E+01 N	N/A	N/A	NO	BSL
	88-75-5	2-Nitrophenol	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.0E-01	NA	3.9E+01 N	N/A	N/A	NO	BSL
	534-52-1	4,6-Dinitro-2-methylphenol	9.8E-02 J	9.8E-02 J	MG/KG	IS28SS36-0001	1/70	0.88 - 6	9.8E-02	NA	7.8E-01 N	N/A	N/A	NO	BSL
	101-55-3	4-Bromophenyl-phenylether	1.2E-01 J	1.2E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.2E-01	NA	3.9E+01 N	N/A	N/A	NO	BSL
	59-50-7	4-Chloro-3-methylphenol	8.2E-02 J	8.2E-02 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	8.2E-02	NA	3.9E+01 N	N/A	N/A	NO	BSL
	7005-72-3	4-Chlorophenyl-phenylether	1.2E-01 J	1.2E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.2E-01	NA	3.9E+01 N	N/A	N/A	NO	BSL
	106-44-5	4-Methylphenol	8.0E-02 J	8.0E-02 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	8.0E-02	NA	3.9E+01 N	N/A	N/A	NO	BSL
	83-32-9	Acenaphthene	2.5E-02 J	1.3E-01 J	MG/KG	IS28SS36-0001	4/70	0.35 - 2.4	1.3E-01	NA	4.7E+02 N	1.0E+01	SSL	NO	BSL
	208-96-8	Acenaphthylene	2.2E-02 J	1.2E-01 J	MG/KG	IS28SS36-0001	6/70	0.35 - 2.4	1.2E-01	NA	1.6E+02 N	N/A	N/A	NO	BSL
	98-86-2	Acetophenone	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.0E-01	NA	7.8E+02 N	3.2E-01	SSL	NO	BSL
	120-12-7	Anthracene	2.6E-02 J	1.2E-01 J	MG/KG	IS28SS36-0001	7/70	0.35 - 2.4	1.2E-01	NA	2.3E+03 N	4.7E+01	SSL	NO	BSL
	1912-24-9	Atrazine	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.0E-01	NA	2.9E+00 C	8.8E-03	SSL	NO	BSL

Table 2.1
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Remedial Investigation Report Site 28
IHDIV-NSWC

Scenario Timeframe: Current
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	100-52-7	Benzaldehyde	2.6E-02 J	1.5E-01 J	MG/KG	IS28SS36-0001	4/70	0.35 - 2.4	1.5E-01	NA	7.8E+02 N	N/A	N/A	NO	BSL
	56-55-3	Benzo(a)anthracene	2.1E-02 J	5.4E-01	MG/KG	IS28SS15-0001	26/70	0.35 - 2.4	5.4E-01	NA	8.7E-01 C	1.5E+00	SSL	NO	BSL
	50-32-8	Benzo(a)pyrene	3.0E-02 J	8.1E-01	MG/KG	IS28SS15-0001	24/70	0.35 - 2.4	8.1E-01	NA	8.7E-02 C	3.7E-01	SSL	YES	ASL
	205-99-2	Benzo(b)fluoranthene	2.3E-02 J	1.7E+00	MG/KG	IS28SS15-0001	29/70	0.35 - 2.4	1.7E+00	NA	8.7E-01 C	4.5E+00	SSL	YES	ASL
	191-24-2	Benzo(g,h,i)perylene	1.5E-02 J	5.4E-01 J	MG/KG	IS28SS42-0001	16/70	0.35 - 2.4	5.4E-01	NA	2.3E+02 N	N/A	N/A	NO	BSL
	207-08-9	Benzo(k)fluoranthene	1.9E-02 J	6.6E-01	MG/KG	IS28SS15-0001	20/70	0.35 - 2.4	6.6E-01	NA	8.7E+00 C	4.5E+01	SSL	NO	BSL
	108-60-1	Bis(2-chloro-1-methylethyl) ether	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.0E-01	NA	5.8E-01 C	N/A	N/A	NO	BSL
	85-68-7	Butylbenzylphthalate	4.5E-02 J	3.4E-01 J	MG/KG	IS28SS06-0001	7/70	0.35 - 2.4	3.4E-01	NA	1.6E+03 N	1.7E+03	SSL	NO	BSL
	105-60-2	Caprolactam	8.6E-02 J	8.6E-02 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	8.6E-02	NA	3.9E+03 N	N/A	N/A	NO	BSL
	86-74-8	Carbazole	2.2E-02 J	1.4E-01 J	MG/KG	IS28SS36-0001	5/70	0.35 - 2.4	1.4E-01	NA	3.2E+01 C	4.7E-01	SSL	NO	BSL
	218-01-9	Chrysene	2.3E-02 J	6.2E-01	MG/KG	IS28SS15-0001	28/70	0.35 - 2.4	6.2E-01	NA	8.7E+01 C	1.5E+02	SSL	NO	BSL
	84-74-2	Di-n-butylphthalate	1.9E-02 J	6.4E-01	MG/KG	IS28SB22-0103	19/70	0.35 - 2.4	6.4E-01	NA	7.8E+02 N	5.0E+02	SSL	NO	BSL
	117-84-0	Di-n-octylphthalate	1.2E-01 J	1.2E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.2E-01	NA	1.6E+02 N	4.9E+05	SSL	NO	BSL
	53-70-3	Dibenz(a,h)anthracene	2.9E-02 J	5.0E-01 J	MG/KG	IS28SS42-0001	10/70	0.35 - 2.4	5.0E-01	NA	8.7E-02 C	1.4E+00	SSL	YES	ASL
	132-64-9	Dibenzofuran	2.2E-02 J	1.2E-01 J	MG/KG	IS28SS36-0001	4/70	0.35 - 2.4	1.2E-01	NA	1.6E+01 N	3.8E-01	SSL	NO	BSL
	84-66-2	Diethylphthalate	2.3E-02 J	1.6E-01 J	MG/KG	IS28SS19-0001	9/70	0.35 - 2.4	1.6E-01	NA	6.3E+03 N	4.5E+01	SSL	NO	BSL
	131-11-3	Dimethyl phthalate	1.1E-01 J	1.1E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.1E-01	NA	7.8E+04 N	N/A	N/A	NO	BSL
	206-44-0	Fluoranthene	2.0E-02 J	8.5E-01	MG/KG	IS28SS17-0001	32/70	0.35 - 2.4	8.5E-01	NA	3.1E+02 N	6.3E+02	SSL	NO	BSL
	86-73-7	Fluorene	5.8E-02 J	1.2E-01 J	MG/KG	IS28SS36-0001	3/70	0.35 - 2.4	1.2E-01	NA	3.1E+02 N	1.4E+01	SSL	NO	BSL
	118-74-1	Hexachlorobenzene	1.3E-01 J	1.3E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.3E-01	NA	4.0E-01 C	5.2E-02	SSL	NO	BSL
	87-68-3	Hexachlorobutadiene	1.2E-01 J	1.2E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.2E-01	NA	1.6E+00 N	1.8E+00	SSL	NO	BSL
	77-47-4	Hexachlorocyclopentadiene	7.9E-02 J	7.9E-02 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	7.9E-02	NA	4.7E+01 N	1.8E+02	SSL	NO	BSL
	67-72-1	Hexachloroethane	9.5E-02 J	9.5E-02 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	9.5E-02	NA	7.8E+00 N	3.6E-01	SSL	NO	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	3.0E-02 J	1.1E+00	MG/KG	IS28SS15-0001	22/70	0.35 - 2.4	1.1E+00	NA	8.7E-01 C	1.3E+01	SSL	YES	ASL
	78-59-1	Isophorone	1.1E-01 J	1.1E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.1E-01	NA	6.7E+02 C	4.1E-01	SSL	NO	BSL
	91-20-3	Naphthalene	2.5E-02 J	1.1E-01 J	MG/KG	IS28SS36-0001	3/70	0.35 - 2.4	1.1E-01	NA	1.6E+02 N	1.5E-02	SSL	NO	BSL
	98-95-3	Nitrobenzene	1.2E-01 L	1.2E-01 L	MG/KG	IS28SS06-0001	1/70	0.35 - 2.4	1.2E-01	NA	3.9E+00 N	2.3E-03	SSL	NO	BSL
	87-86-5	Pentachlorophenol	1.3E-01 J	1.3E-01 J	MG/KG	IS28SS36-0001	1/70	0.88 - 6	1.3E-01	NA	5.3E+00 C	N/A	N/A	NO	BSL
	85-01-8	Phenanthrene	2.1E-02 J	7.4E-01	MG/KG	IS28SS17-0001	22/70	0.35 - 2.4	7.4E-01	NA	2.3E+02 N	6.8E+01	SSL	NO	BSL
	108-95-2	Phenol	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.0E-01	NA	2.3E+03 N	6.7E+00	SSL	NO	BSL
	129-00-0	Pyrene	2.0E-02 J	7.4E-01	MG/KG	IS28SB42-0103	34/70	0.35 - 2.4	7.4E-01	NA	2.3E+02 N	6.8E+01	SSL	NO	BSL
	111-91-1	bis(2-Chloroethoxy)methane	1.1E-01 J	1.1E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.1E-01	NA	9.1E+00 C	N/A	N/A	NO	BSL
	111-44-4	bis(2-Chloroethyl)ether	1.1E-01 J	1.1E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.1E-01	NA	5.8E-01 C	4.4E-05	SSL	NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	5.8E-02 J	3.3E-01 J	MG/KG	IS28SS21-0001P	10/70	0.35 - 2.4	3.3E-01	6.4E+02	4.6E+01 C	2.9E+03	SSL	NO	BSL
	621-64-7	n-Nitroso-di-n-propylamine	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.0E-01	NA	9.1E-02 C	4.7E-05	SSL	YES	ASL
	86-30-6	n-Nitrosodiphenylamine	2.3E-02 J	1.2E+01	MG/KG	IS28SS19-0001	15/70	0.35 - 2.4	1.2E+01	NA	1.3E+02 C	7.6E-01	SSL	NO	BSL
	99-35-4	1,3,5-Trinitrobenzene	2.4E-01	6.7E-01	MG/KG	IS28SS11-0001P	3/70	0.1 - 0.1	6.7E-01	NA	2.3E+02 N	N/A	N/A	NO	BSL

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Remedial Investigation Report Site 28

IHDIV-NSWC

Scenario Timeframe: Current
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	99-65-0	1,3-Dinitrobenzene	6.3E-02 J	6.3E-02 J	MG/KG	IS28SB08-0103	1/70	0.1 - 0.1	6.3E-02	NA	7.8E-01 N	3.7E-03	SSL	NO	BSL
	118-96-7	2,4,6-Trinitrotoluene	4.1E-02 J	4.5E-01 L	MG/KG	IS28SS24-0001	12/70	0.1 - 0.1	4.5E-01	NA	3.9E+00 N	N/A	N/A	NO	BSL
	121-14-2	2,4-Dinitrotoluene	6.7E-02 J	2.3E-01	MG/KG	IS28SS24-0001	5/70	0.1 - 0.1	2.3E-01	NA	1.6E+01 N	5.7E-03	SSL	NO	BSL
	2691-41-0	HMX	2.3E-01	2.3E-01	MG/KG	IS28SS37-0001	1/70	0.2 - 0.2	2.3E-01	NA	3.9E+02 N	N/A	N/A	NO	BSL
	98-95-3	Nitrobenzene	4.7E-02 L	2.6E-01 L	MG/KG	IS28SB19-0105	17/70	0.1 - 0.1	2.6E-01	NA	3.9E+00 N	2.3E-04	SSL	NO	BSL
	479-45-8	Tetryl	5.4E-02 J	6.2E-01	MG/KG	IS28SS24-0001	4/70	0.2 - 0.2	6.2E-01	NA	7.8E+01 N	N/A	N/A	NO	BSL
	7429-90-5	Aluminum	1.0E+03	1.5E+04	MG/KG	IS28SB06-0103	70/70	28 - 110	1.5E+04	1.8E+04	7.8E+03 N	N/A	N/A	YES	ASL
	7440-36-0	Antimony	6.7E-01 J	1.0E+02 L	MG/KG	IS28SB19-0105	7/30	8.4 - 34	1.0E+02	3.6E+00	3.1E+00 N	1.3E+00	SSL	YES	ASL
	7440-38-2	Arsenic	9.1E-01 J	3.8E+02 L	MG/KG	IS28SS04-0001	68/70	1.4 - 5.6	3.8E+02	4.3E+00	4.3E-01 C	2.6E-02	SSL	YES	ASL
	7440-39-3	Barium	1.3E+01 J	3.7E+03	MG/KG	IS28SB19-0105	70/70	28 - 110	3.7E+03	1.4E+02	5.5E+02 N	2.1E+02	SSL	YES	ASL
	7440-41-7	Beryllium	5.7E-01 J	2.0E+00 J	MG/KG	IS28SS22-0001	7/70	0.7 - 2.8	2.0E+00	9.1E-01	1.6E+01 N	1.2E+02	SSL	NO	BSL
	7440-43-9	Cadmium	3.2E-01 J	1.4E+02	MG/KG	IS28SS19-0001	36/70	0.7 - 2.8	1.4E+02	2.6E-01	7.8E+00 N	5.5E+00	SSL	YES	ASL
	7440-70-2	Calcium	4.9E+01 J	2.4E+04	MG/KG	IS28SS10-0001	70/70	700 - 2800	2.4E+04	2.0E+02	NA	N/A	N/A	NO	NUT
	7440-47-3	Chromium	1.6E+00 J	1.8E+02	MG/KG	IS28SB19-0105	69/70	1.4 - 5.6	1.8E+02	2.4E+01	2.3E+01 N	4.2E+00	SSL	YES	ASL
	7440-48-4	Cobalt	7.6E-01 J	1.9E+01 J	MG/KG	IS28SB19-0105	65/70	7 - 28	1.9E+01	4.0E+01	1.6E+02 N	N/A	N/A	NO	BSL
	7440-50-8	Copper	2.3E+00 J	2.3E+03	MG/KG	IS28SB19-0105	67/70	3.5 - 14	2.3E+03	1.9E+01	3.1E+02 N	1.1E+03	SSL	YES	ASL
	7439-89-6	Iron	1.3E+03	1.3E+05	MG/KG	IS28SB19-0105	70/70	14 - 56	1.3E+05	4.3E+04	2.3E+03 N	N/A	N/A	YES	ASL
	7439-92-1	Lead	3.6E+00	1.7E+04 J	MG/KG	IS28SB19-0105	70/70	0.43 - 42	5.9E+01	3.8E+01	4.0E+02	N/A	N/A	NO	BSL
	7439-95-4	Magnesium	9.5E+01 J	2.3E+04	MG/KG	IS28SB19-0105	70/70	700 - 2800	2.3E+04	4.3E+03	NA	N/A	N/A	NO	NUT
	7439-96-5	Manganese	4.2E+00 K	1.1E+03 J	MG/KG	IS28SB19-0105	70/70	2.1 - 8.4	1.1E+03	1.3E+03	1.6E+02 N	9.5E+01	SSL	YES	ASL
	7439-97-6	Mercury	1.2E-01 K	1.2E+01	MG/KG	IS28SS15-0001	20/70	0.068 - 0.42	1.2E+01	8.7E-02	2.3E+00 N	N/A	N/A	YES	ASL
	7440-02-0	Nickel	2.3E+00 J	2.5E+02	MG/KG	IS28SB19-0105	48/70	5.6 - 22	2.5E+02	1.8E+01	1.6E+02 N	N/A	N/A	YES	ASL
	7440-09-7	Potassium	8.9E+01 J	6.1E+03	MG/KG	IS28SB19-0105	60/70	700 - 2800	6.1E+03	1.9E+03	NA	N/A	N/A	NO	NUT
	7782-49-2	Selenium	3.3E-01 J	1.3E+00 J	MG/KG	IS28SS10-0001	13/70	0.7 - 2.8	1.3E+00	8.9E+00	3.9E+01 N	1.9E+00	SSL	NO	BSL
	7440-22-4	Silver	8.3E-01 J	1.6E+01	MG/KG	IS28SS10-0001	16/70	1.4 - 5.6	1.6E+01	6.3E-01	3.9E+01 N	3.1E+00	SSL	NO	BSL
	7440-23-5	Sodium	6.2E+01 J	1.6E+02 J	MG/KG	IS28SB12-0103	8/70	700 - 2800	1.6E+02	5.2E+01	NA	N/A	N/A	NO	NUT
	7440-28-0	Thallium	8.7E-01 J	8.7E-01 J	MG/KG	IS28SB22-0103	1/70	1.4 - 5.6	8.7E-01	3.1E+00	5.5E-01 N	3.6E-01	SSL	YES	ASL
	7440-62-2	Vanadium	3.0E+00 J	9.3E+01 J	MG/KG	IS28SB12-0103	70/70	7 - 28	9.3E+01	5.4E+01	5.5E+01 N	2.2E+01	SSL	YES	ASL
	7440-66-6	Zinc	7.4E+00 K	7.2E+04 L	MG/KG	IS28SS08-0001	70/70	2.8 - 390	7.2E+04	3.8E+01	2.3E+03 N	1.4E+03	SSL	YES	ASL

* Surface soil & subsurface soil combined

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening, except for lead where used average value.

[3] Background values are 95% UTL from Background Investigation Report.

[4] Risk-Based Concentration Table, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard. Residential Soil RBC.
RBC value for 2-chlorophenol used as surrogate for 2-nitrophenol and 4-chloro-3-methylphenol.
RBC value for methoxychlor used as surrogate for 4-bromophenyl-phenylether, and 4-chlorophenyl-phenylether.

SQL = Sample Quantification Limit

COPC = Chemical of Potential Concern

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered

J = Estimated Value

K = Biased High

Table 2.1

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Remedial Investigation Report Site 28

IHDIV-NSWC

Scenario Timeframe: Current
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

RBC value for bis(2-chloroethyl)ether used as surrogate for bis(2-chloro-1-methylethyl) ether.

RBC value for bis(2-chloro) isopropyl ether used as surrogate for bis(2-chloroethoxy) methane.

RBC value for pyrene used as surrogate for phenanthrene and benzo(g,h,i)perylene.

RBC value for naphthalene used as surrogate for acenaphthylene.

RBC value for chromium VI used for total chromium.

Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.

L = Biased Low

C = Carcinogenic

N = Noncarcinogenic

SSL = Region III Soil Screening Level, for groundwater migration, DAF 20

Cancer benchmark value = 1E-06, adjusted HQ=0.1

(EPA Region III RBC Table)

Table 2.2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Soil*
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Emissions from Site 28 Soil*	540-59-0	1,2-Dichloroethene (total)	2.7E-04 L	8.0E-04 L	ug/m3	IS28SS33-0001	11/30		8.0E-04	NA	3.3E+00 N	NA	NA	NO	BSL
	78-93-3	2-Butanone	3.5E-05 J	7.9E-05 J	ug/m3	IS28SB38-0103	2/70		7.9E-05	NA	1.0E+02 N	NA	NA	NO	BSL
	67-64-1	Acetone	8.0E-04 J	1.9E-03	ug/m3	IS28SB08-0103	2/70		1.9E-03	NA	3.7E+01 N	NA	NA	NO	BSL
	98-82-8	Cumene	1.5E-03 J	1.5E-03 J	ug/m3	IS28SS41-0001	1/70		1.5E-03	NA	4.0E+01 N	NA	NA	NO	BSL
	100-41-4	Ethylbenzene	7.1E-04 J	7.1E-04 J	ug/m3	IS28SB32-0103	1/70		7.1E-04	NA	1.1E+02 N	NA	NA	NO	BSL
	79-20-9	Methyl acetate	4.55E-09 J	4.55E-09 J	ug/m3	IS28SB32-0103 IS28SS37-0001	2/70		4.5E-09	NA	3.7E+02 N	NA	NA	NO	BSL
	1634-04-4	Methyl-tert-butyl ether (MTBE)	6.6E-05 J	1.8E-03 L	ug/m3	IS28SS33-0001 IS28SB04-0103	36/70		1.8E-03	NA	1.6E+00 C	NA	NA	NO	BSL
	75-09-2	Methylene chloride	3.1E-04 J	3.1E-04 J	ug/m3	IS28SB08-0103	1/70		3.1E-04	NA	3.8E+00 C	NA	NA	NO	BSL
	100-42-5	Styrene	5.2E-04 J	5.2E-04 J	ug/m3	IS28SS27-0001	1/70		5.2E-04	NA	1.0E+02 N	NA	NA	NO	BSL
	79-01-6	Trichloroethene	4.7E-03	4.7E-03	ug/m3	IS28SB20-0103 IS28SS28-0001	1/70		4.7E-03	NA	1.6E-02 C	NA	NA	NO	BSL
	1330-20-7	Xylene, total	2.8E-04 J	2.8E-04 J	ug/m3	IS28SS21-0001P	1/70		2.8E-04	NA	1.1E+01 N	NA	NA	NO	BSL
	156-59-2	cis-1,2-Dichloroethene	2.7E-04 L	7.96E-04 L	ug/m3	IS28SS33-0001	11/70		8.0E-04	NA	3.7E+00 N	NA	NA	NO	BSL
	92-52-4	1,1-Biphenyl	5.5E-04 J	5.5E-04 J	ug/m3	IS28SS36-0001	1/70		5.5E-04	NA	1.8E+01 N	NA	NA	NO	BSL
	95-95-4	2,4,5-Trichlorophenol	9.85E-08 J	9.85E-08 J	ug/m3	IS28SS36-0001	1/70		9.8E-08	NA	3.7E+01 N	NA	NA	NO	BSL
	88-06-2	2,4,6-Trichlorophenol	7.58E-08 J	7.58E-08 J	ug/m3	IS28SS36-0001	1/70		7.6E-08	NA	6.3E-01 C	NA	NA	NO	BSL
	120-83-2	2,4-Dichlorophenol	7.58E-08 J	7.58E-08 J	ug/m3	IS28SS36-0001	1/70		7.6E-08	NA	1.1E+00 N	NA	NA	NO	BSL
	105-67-9	2,4-Dimethylphenol	5.83E-08 J	5.83E-08 J	ug/m3	IS28SS36-0001	1/70		5.8E-08	NA	7.3E+00 N	NA	NA	NO	BSL
	121-14-2	2,4-Dinitrotoluene	7.58E-08 J	9.09E-07 J	ug/m3	IS28SS10-0001	4/70		9.1E-07	NA	7.3E-01 N	NA	NA	NO	BSL
	606-20-2	2,6-Dinitrotoluene	8.33E-08 J	8.33E-08 J	ug/m3	IS28SS36-0001	1/70		8.3E-08	NA	3.7E-01 N	NA	NA	NO	BSL
	91-58-7	2-Chloronaphthalene	1.1E-03 J	1.1E-03 J	ug/m3	IS28SS36-0001	1/70		1.1E-03	NA	2.9E+01 N	NA	NA	NO	BSL
	95-57-8	2-Chlorophenol	2.6E-03 J	2.6E-03 J	ug/m3	IS28SS36-0001	1/70		2.6E-03	NA	1.8E+00 N	NA	NA	NO	BSL
	91-57-6	2-Methylnaphthalene	4.3E-04 J	2.0E-03 J	ug/m3	IS28SS36-0001	2/70		2.0E-03	NA	7.3E+00 N	NA	NA	NO	BSL
	95-48-7	2-Methylphenol	3.2E-04 J	3.2E-04 J	ug/m3	IS28SS36-0001	1/70		3.2E-04	NA	1.8E+01 N	NA	NA	NO	BSL
	88-74-4	2-Nitroaniline	4.85E-08 J	4.85E-08 J	ug/m3	IS28SS36-0001	1/70		4.8E-08	NA	2.1E-02 N	NA	NA	NO	BSL
	88-75-5	2-Nitrophenol	7.58E-08 J	7.58E-08 J	ug/m3	IS28SS36-0001	1/70		7.6E-08	NA	1.8E+00 N	NA	NA	NO	BSL
	534-52-1	4,6-Dinitro-2-methylphenol	7.42E-08 J	7.42E-08 J	ug/m3	IS28SS36-0001	1/70		7.4E-08	NA	3.7E-02 N	NA	NA	NO	BSL
	101-55-3	4-Bromophenyl-phenylether	9.09E-08 J	9.09E-08 J	ug/m3	IS28SS36-0001	1/70		9.1E-08	NA	1.8E+00 N	NA	NA	NO	BSL
	59-50-7	4-Chloro-3-methylphenol	6.21E-08 J	6.21E-08 J	ug/m3	IS28SS36-0001	1/70		6.2E-08	NA	1.8E+00 N	NA	NA	NO	BSL
	7005-72-3	4-Chlorophenyl-phenylether	9.09E-08 J	9.09E-08 J	ug/m3	IS28SS36-0001	1/70		9.1E-08	NA	1.8E+00 N	NA	NA	NO	BSL
	106-44-5	4-Methylphenol	6.06E-08 J	6.06E-08 J	ug/m3	IS28SS36-0001	1/70		6.1E-08	NA	1.8E+00 N	NA	NA	NO	BSL
	83-32-9	Acenaphthene	8.8E-05 J	4.6E-04 J	ug/m3	IS28SS36-0001	4/70		4.6E-04	NA	2.2E+01 N	NA	NA	NO	BSL
	208-96-8	Acenaphthylene	1.67E-08 J	9.09E-08 J	ug/m3	IS28SS39-0001	6/70		9.1E-08	NA	3.3E-01 N	NA	NA	NO	BSL
	98-86-2	Acetophenone	7.58E-08 J	7.58E-08 J	ug/m3	IS28SS36-0001	1/70		7.6E-08	NA	2.1E-03 N	NA	NA	NO	BSL
	120-12-7	Anthracene	2.6E-05 J	1.2E-04 J	ug/m3	IS28SS34-0001	7/70		1.2E-04	NA	1.1E+02 N	NA	NA	NO	BSL
	1912-24-9	Atrazine	7.58E-08 J	7.58E-08 J	ug/m3	IS28SS36-0001	1/70		7.6E-08	NA	2.8E-02 C	NA	NA	NO	BSL

Table 2.2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Soil*
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	100-52-7	Benzaldehyde	2.0E-08 J	1.14E-07 J	ug/m^3	IS28SS36-0001	4/70		1.1E-07	NA	3.7E+01 N	NA	NA	NO	BSL
	56-55-3	Benzo(a)anthracene	1.59E-08 J	4.09E-07	ug/m^3	IS28SS34-0001 IS28SS39-0001	26/70		4.1E-07	NA	8.6E-03 C	NA	NA	NO	BSL
	50-32-8	Benzo(a)pyrene	2.27E-08 J	6.14E-07	ug/m^3	IS28SS39-0001	24/70		6.1E-07	NA	2.0E-03 C	NA	NA	NO	BSL
	205-99-2	Benzo(b)fluoranthene	1.74E-08 J	1.29E-06	ug/m^3	IS28SS34-0001	29/70		1.3E-06	NA	8.6E-03 C	NA	NA	NO	BSL
	191-24-2	Benzo(g,h,i)perylene	1.14E-08 J	4.09E-07 J	ug/m^3	IS28SS42-0001	16/70		4.1E-07	NA	1.1E+01 N	NA	NA	NO	BSL
	207-08-9	Benzo(k)fluoranthene	1.44E-08 J	5E-07	ug/m^3	IS28SS34-0001	20/70		5.0E-07	NA	8.6E-02 C	NA	NA	NO	BSL
	108-60-1	Bis(2-chloro-1-methylethyl) ether	7.58E-08 J	7.58E-08 J	ug/m^3	IS28SS36-0001	1/70		7.6E-08	NA	5.7E-03 C	NA	NA	NO	BSL
	85-68-7	Butylbenzylphthalate	3.41E-08 J	2.58E-07 J	ug/m^3	IS28SS01-0001	7/70		2.6E-07	NA	7.3E+01 N	NA	NA	NO	BSL
	105-60-2	Caprolactam	6.52E-08 J	6.52E-08 J	ug/m^3	IS28SS36-0001	1/70		6.5E-08	NA	1.8E+02 N	NA	NA	NO	BSL
	86-74-8	Carbazole	1.67E-08 J	1.06E-07 J	ug/m^3	IS28SS36-0001	5/70		1.1E-07	NA	3.1E-01 C	NA	NA	NO	BSL
	218-01-9	Chrysene	1.74E-08 J	4.7E-07	ug/m^3	IS28SS39-0001	28/70		4.7E-07	NA	8.6E-01 C	NA	NA	NO	BSL
	84-74-2	Di-n-butylphthalate	1.44E-08 J	4.85E-07	ug/m^3	IS28SB22-0103	19/70		4.8E-07	NA	3.7E+01 N	NA	NA	NO	BSL
	117-84-0	Di-n-octylphthalate	9.09E-08 J	9.09E-08 J	ug/m^3	IS28SS36-0001	1/70		9.1E-08	NA	7.3E+00 N	NA	NA	NO	BSL
	53-70-3	Dibenz(a,h)anthracene	2.2E-08 J	3.79E-07 J	ug/m^3	IS28SS42-0001	10/70		3.8E-07	NA	8.6E-04 C	NA	NA	NO	BSL
	132-64-9	Dibenzofuran	8.5E-05 J	4.6E-04 J	ug/m^3	IS28SS36-0001	4/70		4.6E-04	NA	7.3E-01 N	NA	NA	NO	BSL
	84-66-2	Diethylphthalate	1.74E-08 J	1.21E-07 J	ug/m^3	IS28SS19-0001	9/70		1.2E-07	NA	2.9E+02 N	NA	NA	NO	BSL
	131-11-3	Dimethyl phthalate	8.33E-08 J	8.33E-08 J	ug/m^3	IS28SS36-0001	1/70		8.3E-08	NA	3.7E+03 N	NA	NA	NO	BSL
	206-44-0	Fluoranthene	1.52E-08 J	6.44E-07	ug/m^3	IS28SS39-0001	32/70		6.4E-07	NA	1.5E+01 N	NA	NA	NO	BSL
	86-73-7	Fluorene	8.8E-05 J	1.8E-04 J	ug/m^3	IS28SS36-0001	3/70		1.8E-04	NA	1.5E+01 N	NA	NA	NO	BSL
	118-74-1	Hexachlorobenzene	9.85E-08 J	9.85E-08 J	ug/m^3	IS28SS36-0001	1/70		9.8E-08	NA	3.9E-03 C	NA	NA	NO	BSL
	87-68-3	Hexachlorobutadiene	9.09E-08 J	9.09E-08 J	ug/m^3	IS28SS36-0001	1/70		9.1E-08	NA	7.3E-02 NI	NA	NA	NO	BSL
	77-47-4	Hexachlorocyclopentadiene	6.0E-08 J	5.98E-08 J	ug/m^3	IS28SS36-0001	1/70		6.0E-08	NA	2.1E-02 N	NA	NA	NO	BSL
	67-72-1	Hexachloroethane	7.2E-08 J	7.2E-08 J	ug/m^3	IS28SS36-0001	1/70		7.2E-08	NA	3.7E-01 NI	NA	NA	NO	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	2.27E-08 J	8.33E-07	ug/m^3	IS28SS15-0001	22/70		8.3E-07	NA	8.6E-03 C	NA	NA	NO	BSL
	78-59-1	Isophorone	8.33E-08 J	8.33E-08 J	ug/m^3	IS28SS36-0001	1/70		8.3E-08	NA	6.6E+00 C	NA	NA	NO	BSL
	91-20-3	Naphthalene	3.5E-04 J	1.5E-03 J	ug/m^3	IS28SS36-0001	3/70		1.5E-03	NA	3.3E-01 N	NA	NA	NO	BSL
	98-95-3	Nitrobenzene	2.1E-03 L	2.1E-03 L	ug/m^3	IS28SS06-0001	1/70		2.1E-03	NA	2.2E-01 N	NA	NA	NO	BSL
	87-86-5	Pentachlorophenol	9.85E-08 J	9.85E-08 J	ug/m^3	IS28SS36-0001	1/70		9.8E-08	NA	5.2E-02 C	NA	NA	NO	BSL
	85-01-8	Phenanthrene	1.59E-08 J	5.61E-07	ug/m^3	IS28SS17-0001	22/70		5.6E-07	NA	1.1E+01 N	NA	NA	NO	BSL
	108-95-2	Phenol	7.58E-08 J	7.58E-08 J	ug/m^3	IS28SS36-0001	1/70		7.6E-08	NA	1.1E+02 N	NA	NA	NO	BSL
	129-00-0	Pyrene	4.1E-06 J	1.5E-04	ug/m^3	IS28SS34-0001	34/70		1.5E-04	NA	1.1E+01 N	NA	NA	NO	BSL
	111-91-1	bis(2-Chloroethoxy)methane	8.33E-08 J	8.33E-08 J	ug/m^3	IS28SS36-0001	1/70		8.3E-08	NA	1.8E-01 C	NA	NA	NO	BSL
	111-44-4	bis(2-Chloroethyl)ether	2.6E-03 J	2.6E-03 J	ug/m^3	IS28SS36-0001	1/70		2.6E-03	NA	5.7E-03 C	NA	NA	NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	2.5E-07 J	1.4E-06 J	ug/m^3	IS28SS01-0001	10/70		1.4E-06	NA	4.5E-01 C	NA	NA	NO	BSL
	621-64-7	n-Nitroso-di-n-propylamine	7.6E-08 J	7.6E-08 J	ug/m^3	IS28SS36-0001	1/70		7.6E-08	NA	8.9E-04 C	NA	NA	NO	BSL
	86-30-6	n-Nitrosodiphenylamine	1.7E-08 J	9.1E-06	ug/m^3	IS28SS19-0001	15/70		9.1E-06	NA	1.3E+00 C	NA	NA	NO	BSL

Table 2.2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Soil*
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	99-35-4	1,3,5-Trinitrobenzene	1.8E-07	5.1E-07	ug/m^3	IS28SS11-0001P	3/70		5.1E-07	NA	1.1E+01 N	NA	NA	NO	BSL
	99-65-0	1,3-Dinitrobenzene	4.8E-08 J	4.8E-08 J	ug/m^3	IS28SB08-0103	1/70		4.8E-08	NA	3.7E-02 N	NA	NA	NO	BSL
	118-96-7	2,4,6-Trinitrotoluene	3.1E-08 J	3.4E-07 L	ug/m^3	IS28SS24-0001	12/70		3.4E-07	NA	1.8E-01 N	NA	NA	NO	BSL
	121-14-2	2,4-Dinitrotoluene	5.1E-08 J	1.7E-07	ug/m^3	IS28SS24-0001	5/70		1.7E-07	NA	7.3E-01 N	NA	NA	NO	BSL
	2691-41-0	HMX	1.7E-07	1.7E-07	ug/m^3	IS28SS37-0001	1/70		1.7E-07	NA	1.8E+01 N	NA	NA	NO	BSL
	98-95-3	Nitrobenzene	3.6E-08 L	2.0E-07 L	ug/m^3	IS28SB19-0105	17/70		2.0E-07	NA	2.2E-01 N	NA	NA	NO	BSL
	479-45-8	Tetryl	4.1E-08 J	4.7E-07	ug/m^3	IS28SS24-0001	4/70		4.7E-07	NA	3.7E+00 N	NA	NA	NO	BSL
	7429-90-5	Aluminum	7.9E-04	1.1E-02	ug/m^3	IS28SB06-0103	70/70		1.1E-02	NA	3.7E-01 N	NA	NA	NO	BSL
	7440-36-0	Antimony	5.1E-07 J	7.7E-05 L	ug/m^3	IS28SB19-0105	7/30		7.7E-05	NA	1.5E-01 N	NA	NA	NO	BSL
	7440-38-2	Arsenic	6.9E-07 J	2.9E-04 L	ug/m^3	IS28SS04-0001	68/70		2.9E-04	NA	4.1E-04 C	NA	NA	NO	BSL
	7440-39-3	Barium	9.7E-06 J	2.8E-03	ug/m^3	IS28SB19-0105	70/70		2.8E-03	NA	5.1E-02 N	NA	NA	NO	BSL
	7440-41-7	Beryllium	4.3E-07 J	1.5E-06 J	ug/m^3	IS28SS22-0001	7/70		1.5E-06	NA	7.5E-04 C	NA	NA	NO	BSL
	7440-43-9	Cadmium	2.4E-07 J	1.1E-04	ug/m^3	IS28SS19-0001	36/70		1.1E-04	NA	9.9E-04 C	NA	NA	NO	BSL
	7440-70-2	Calcium	3.7E-05 J	1.8E-02	ug/m^3	IS28SS10-0001	70/70		1.8E-02	NA	NA	NA	NA	NO	NUT
	7440-47-3	Chromium	1.2E-06 J	1.3E-04	ug/m^3	IS28SB19-0105	69/70		1.3E-04	NA	1.5E-04 C	NA	NA	NO	BSL
	7440-48-4	Cobalt	5.8E-07 J	1.5E-05 J	ug/m^3	IS28SB34-0103	65/70		1.5E-05	NA	6.4E-04 C	NA	NA	NO	BSL
	7440-50-8	Copper	1.7E-06 J	1.7E-03	ug/m^3	IS28SB19-0105	67/70		1.7E-03	NA	1.5E+01 N	NA	NA	NO	BSL
	7439-89-6	Iron	1.0E-03	9.8E-02	ug/m^3	IS28SB19-0105	70/70		9.8E-02	NA	1.1E+02 N	NA	NA	NO	BSL
	7439-92-1	Lead	2.7E-06	1.3E-02 J	ug/m^3	IS28SB19-0105	70/70		1.3E-02	NA	NA	NA	NA	NO	NTX
	7439-95-4	Magnesium	7.2E-05 J	1.8E-02	ug/m^3	IS28SB19-0105	70/70		1.8E-02	NA	NA	NA	NA	NO	NUT
	7439-96-5	Manganese	3.2E-06 K	8.0E-04 J	ug/m^3	IS28SB19-0105	70/70		8.0E-04	NA	5.2E-03 N	NA	NA	NO	BSL
	7439-97-6	Mercury	9.1E-08 K	8.7E-06	ug/m^3	IS28SS15-0001	20/70		8.7E-06	NA	3.1E-02 N	NA	NA	NO	BSL
	7440-02-0	Nickel	1.7E-06 J	1.9E-04	ug/m^3	IS28SB19-0105	48/70		1.9E-04	NA	7.3E+00 N	NA	NA	NO	BSL
	7440-09-7	Potassium	6.7E-05 J	4.7E-03	ug/m^3	IS28SB19-0105	60/70		4.7E-03	NA	NA	NA	NA	NO	NUT
	7782-49-2	Selenium	2.5E-07 J	9.8E-07 J	ug/m^3	IS28SS10-0001	13/70		9.8E-07	NA	1.8E+00 N	NA	NA	NO	BSL
	7440-22-4	Silver	6.3E-07 J	1.2E-05	ug/m^3	IS28SS10-0001	16/70		1.2E-05	NA	1.8E+00 N	NA	NA	NO	BSL
	7440-23-5	Sodium	4.7E-05 J	1.2E-04 J	ug/m^3	IS28SB12-0103	8/70		1.2E-04	NA	NA	NA	NA	NO	NUT
	7440-28-0	Thallium	6.6E-07 J	6.6E-07 J	ug/m^3	IS28SB22-0103	1/70		6.6E-07	NA	2.6E-02 N	NA	NA	NO	BSL
	7440-62-2	Vanadium	2.3E-06 J	7.0E-05 J	ug/m^3	IS28SB12-0103	70/70		7.0E-05	NA	1.1E-01 N	NA	NA	NO	BSL
	7440-66-6	Zinc	5.6E-06 K	5.4E-02 L	ug/m^3	IS28SS08-0001	70/70		5.4E-02	NA	1.1E+02 N	NA	NA	NO	BSL

* Surface soil & subsurface soil combined

[1] Minimum/Maximum calculated air concentrations from soil concentrations. Air concentrations calculated as Cair = Csoil*1000*(1/PEF+1/VF)
VF only included in calculation for VOCs. VF calculated on Table 2.2A. PEF = 1.32E+09 m3/kg.

[2] Maximum concentration is used for screening.

[3] Background values are the lesser of a comparison of the surface and subsurface soil 95% UTLs from Background Investigation Report.

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered

Table 2.2
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Soil*
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

[4] Risk-Based Concentration Table, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard. Ambient Air RBC.
RBC value for pyrene used as surrogate for phenanthrene and benzo(g,h,i)perylene.
RBC value for 2-chlorophenol used as surrogate for 2-nitrophenol and 4-Chloro-3-methylphenol.
RBC value for methoxychlor used as surrogate for 4-bromophenyl-phenylether, and 4-chlorophenyl-phenylether.
RBC value for bis(2-chloroethyl)ether used as surrogate for bis(2-chloro-1-methylethyl) ether.
RBC value for bis(2-chloro) isoprpyl ehter used as surrogate for bis(2-chloroethoxy) methane.
RBC value for naphthalene used as surrogate for acenaphthylene.
RBC value for Chromium VI used for total chromium.
RBC value for manganese-nonfood used as surrogate for manganese.
RBC value for mercuric chloride used as surrogate for mercury.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.2A

Calculation of Volatilization Factor - Combined Surface and Subsurface Soil

Site 28 IHDIV-NSWC

Indian Head, Maryland

Chemical	Diffusivity in Air (D_i) (cm^2/s)	Henry's Law Constant (H') (unitless)	Diffusivity in Water (D_w) (cm^2/s)	Soil Organic Carbon Partition Coeff. (K_{oc}) (cm^3/g)	Soil Water Partition Coeff. ($K_d = K_{oc} \times F_{oc}$) ($g/cm^3$)	Solubility in Water (S) (mg/L)	Apparent Diffusivity (D_A) (cm^2/s)	Volatilization Factor (VF) (m^3/kg)	Soil Conc (I
Volatile Organics									
1,2-Dichloroethene (total)	7.36E-02	1.67E-01	1.13E-05	3.55E+01	2.13E-01	3.50E+03	1.90E-03	3.77E+03	1.:
2-Butanone	4.05E-02	1.05E-05	3.80E-05	4.50E+00	2.70E-02	2.39E+05	2.08E-06	1.14E+05	3.(
Acetone	1.24E-01	1.59E-03	1.14E-05	5.75E-01	3.45E-03	1.00E+06	1.02E-04	1.63E+04	1.(
Cumene	7.50E-02	4.72E-01	7.10E-06	2.20E+02	1.32E+00	6.10E+01	1.25E-03	4.65E+03	9.:
Ethylbenzene	7.50E-02	3.23E-01	7.80E-06	3.63E+01	2.18E-01	1.69E+02	3.41E-03	2.82E+03	6.(
Methyl Acetate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Methyl-tert-butyl ether (MTBE)	8.00E-02	2.41E-02	1.00E-05	6.00E+00	3.60E-02	1.50E+05	7.30E-04	6.08E+03	2.
Methylene chloride	1.01E-01	8.98E-02	1.17E-05	1.17E+01	7.02E-02	1.30E+04	2.58E-03	3.23E+03	2.(
Styrene	7.10E-02	1.13E-01	8.00E-06	7.76E+02	4.66E+00	3.10E+02	8.93E-05	1.74E+04	1.(
Trichloroethene	7.90E-02	4.22E-01	9.10E-06	1.66E+02	9.96E-01	1.10E+03	1.51E-03	4.23E+03	1.:
Xylene, total	7.69E-02	3.14E-01	8.44E-06	3.89E+02	2.33E+00	1.85E+02	5.16E-04	7.23E+03	4.(
cis-1,2-Dichloroethene	7.36E-02	1.67E-01	1.13E-05	3.55E+01	2.13E-01	3.50E+03	1.90E-03	3.77E+03	1.:
Semivolatile Organics									
Biphenyl	4.04E-02	1.23E-02	8.20E-06	7.76E+03	4.66E+01	7.50E+00	5.68E-07	2.18E+05	3.:
2-Chloronaphthalene	3.47E-02	1.27E-02	8.80E-06	1.55E+03	9.30E+00	1.20E+01	2.50E-06	1.04E+05	1.
2-Chlorophenol	5.01E-02	1.60E-02	9.46E-06	3.88E+02	2.33E+00	2.24E+04	1.76E-05	3.92E+04	5.(
2-Methylnaphthalene	5.60E-02	2.07E-02	7.84E-06	2.13E+03	1.28E+01	2.54E+01	4.80E-06	7.50E+04	3.:
2-Methylphenol	7.40E-02	4.92E-05	8.30E-06	9.12E+01	5.47E-01	2.60E+04	3.81E-07	2.66E+05	1.(
Acenaphthene	4.21E-02	6.36E-03	7.69E-06	7.08E+03	4.25E+01	4.24E+00	3.36E-07	2.83E+05	1.:
Anthracene	3.24E-02	2.67E-03	7.74E-06	2.95E+04	1.77E+02	4.34E-02	2.63E-08	1.01E+06	7.(
Dibenzofuran	6.19E-02	3.98E-03	1.00E-05	5.48E+03	3.29E+01	5.65E+00	4.00E-07	2.60E+05	1.:
Fluorene	3.63E-02	2.61E-03	7.88E-06	1.38E+04	8.28E+01	1.98E+00	6.15E-08	6.63E+05	1.(
Naphthalene	5.90E-02	1.98E-02	7.50E-06	2.00E+03	1.20E+01	3.10E+01	5.15E-06	7.24E+04	3.:
Nitrobenzene	7.60E-02	9.84E-04	8.60E-06	6.46E+01	3.88E-01	2.09E+03	8.28E-06	5.71E+04	1.(
Pyrene	2.72E-02	4.51E-04	7.24E-06	1.05E+05	6.30E+02	1.35E-01	1.11E-09	4.93E+06	8.:
bis(2-Chloroethyl)ether	6.92E-02	7.38E-04	7.53E-06	1.50E+01	9.00E-02	1.72E+04	1.46E-05	4.31E+04	3.:
bis(2-Ethylhexyl)phthalate	3.51E-02	4.18E-06	3.66E-06	1.51E+07	9.06E+04	3.40E-01	3.43E-13	2.81E+08	3.(

Volatilization factor (VF) = (m^3/kg)

$$\frac{Q/C * (3.14 * D_A * T)^{1/2} * 10^{-4}\ m^2/cm^2}{2 * r_b * D_A}$$

Apparent Diffusivity (D_A) = (cm^2/s)

$$\frac{[(Q_a^{10/3} * D_i * H' + Q_w^{10/3} * D_w)/n^2]}{(r_b * K_d + Q_w + Q_a * H')}$$

Soil Saturation Concentration (C_{sat}) =

$$S/r_b * (K_d * r_b + Q_w + H' * Q_a)$$

Parameters	Values
Q/C - Inverse of the mean concentration at the center of a 0.5-acre-square source located in Philadelphia, PA (g/m^2-s per kg/m^3)	90.24
T - Exposure interval(s)	9.5E+08
r_b - Soil bulk density (g/cm^3)	1.5
Q_a - Air-filled soil porosity (L_{air}/L_{water}) = n - Q_w	0.28
n - Total soil porosity (Lpore/Lsoil) = 1 - (r_b/r_s)	0.43
Q_w - Water-filled soil porosity (Lwater/Lsoil)	0.15
r_s - Soil particle density (g/cm^3)	2.65
f_{oc} - fraction organic carbon in soil (g/g)	0.006

Equations and chemical properties from USEPA, 1996. *Soil Screening Guidance: User's Guide.* EPA/540/R-96/018.
Physical/chemical properties not listed in USEPA, 1996 obtained from USEPA Region 9 Preliminary Remediation Goal support tables, 2002.

Table 2.3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Remedial Investigation Report Site 28
IHDIV-NSWC

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Site 28 Surface Soil	540-59-0	1,2-Dichloroethene (total)	1.0E-03 L	3.0E-03 L	MG/KG	IS28SS33-0001	8/15	0.01 - 0.023	3.0E-03	NA	7.0E+01 N	3.7E-03	SSL	NO	BSL
	98-82-8	Cumene	7.0E-03 J	7.0E-03 J	MG/KG	IS28SS41-0001	1/35	0.01 - 0.023	7.0E-03	NA	7.8E+02 N	6.4E+00	SSL	NO	BSL
	79-20-9	Methyl acetate	6.0E-03 J	6.0E-03 J	MG/KG	IS28SS37-0001	1/35	0.01 - 0.023	6.0E-03	NA	7.8E+03 N	2.5E+00	SSL	NO	BSL
	1634-04-4	Methyl-tert-butyl ether (MTBE)	4.0E-04 J	1.1E-02 L	MG/KG	IS28SS33-0001	19/35	0.01 - 0.023	1.1E-02	NA	1.6E+02 C	1.2E-02	SSL	NO	BSL
	100-42-5	Styrene	9.0E-03 J	9.0E-03 J	MG/KG	IS28SS27-0001	1/35	0.01 - 0.023	9.0E-03	NA	1.6E+03 N	5.7E+00	SSL	NO	BSL
	1330-20-7	Xylene, total	2.0E-03 J	2.0E-03 J	MG/KG	IS28SS21-0001P	1/35	0.01 - 0.023	2.0E-03	NA	1.6E+03 N	3.0E-01	SSL	NO	BSL
	156-59-2	cis-1,2-Dichloroethene	1.0E-03 L	3.0E-03 L	MG/KG	IS28SS33-0001	8/35	0.01 - 0.023	3.0E-03	NA	7.8E+01 N	3.5E-03	SSL	NO	BSL
	92-52-4	1,1-Biphenyl	1.2E-01 J	1.2E-01 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	1.2E-01	NA	3.9E+02 N	9.6E+00	SSL	NO	BSL
	95-95-4	2,4,5-Trichlorophenol	1.3E-01 J	1.3E-01 J	MG/KG	IS28SS36-0001	1/35	0.93 - 6	1.3E-01	NA	7.8E+02 N	N/A	N/A	NO	BSL
	88-06-2	2,4,6-Trichlorophenol	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	1.0E-01	NA	5.8E+01 C	N/A	N/A	NO	BSL
	120-83-2	2,4-Dichlorophenol	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	1.0E-01	NA	2.3E+01 N	1.2E-01	SSL	NO	BSL
	105-67-9	2,4-Dimethylphenol	7.7E-02 J	7.7E-02 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	7.7E-02	NA	1.6E+02 N	6.7E-01	SSL	NO	BSL
	121-14-2	2,4-Dinitrotoluene	1.0E-01 J	1.2E+00 J	MG/KG	IS28SS10-0001	3/35	0.37 - 2.4	1.2E+00	NA	1.6E+01 N	5.7E-03	SSL	NO	BSL
	606-20-2	2,6-Dinitrotoluene	1.1E-01 J	1.1E-01 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	1.1E-01	NA	7.8E+00 N	2.5E-03	SSL	NO	BSL
	91-58-7	2-Chloronaphthalene	1.1E-01 J	1.1E-01 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	1.1E-01	NA	6.3E+02 N	2.0E+00	SSL	NO	BSL
	95-57-8	2-Chlorophenol	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	1.0E-01	NA	3.9E+01 N	N/A	N/A	NO	BSL
	91-57-6	2-Methylnaphthalene	1.5E-01 J	1.5E-01 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	1.5E-01	NA	1.6E+02 N	N/A	N/A	NO	BSL
	95-48-7	2-Methylphenol	8.6E-02 J	8.6E-02 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	8.6E-02	NA	3.9E+02 N	N/A	N/A	NO	BSL
	88-74-4	2-Nitroaniline	6.4E-02 J	6.4E-02 J	MG/KG	IS28SS36-0001	1/35	0.93 - 6	6.4E-02	NA	2.3E+01 N	N/A	N/A	NO	BSL
	88-75-5	2-Nitrophenol	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	1.0E-01	NA	3.9E+01 N	N/A	N/A	NO	BSL
	534-52-1	4,6-Dinitro-2-methylphenol	9.8E-02 J	9.8E-02 J	MG/KG	IS28SS36-0001	1/35	0.93 - 6	9.8E-02	NA	7.8E-01 N	N/A	N/A	NO	BSL
	101-55-3	4-Bromophenyl-phenylether	1.2E-01 J	1.2E-01 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	1.2E-01	NA	3.9E+01 N	N/A	N/A	NO	BSL
	59-50-7	4-Chloro-3-methylphenol	8.2E-02 J	8.2E-02 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	8.2E-02	NA	3.9E+01 N	N/A	N/A	NO	BSL
	7005-72-3	4-Chlorophenyl-phenylether	1.2E-01 J	1.2E-01 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	1.2E-01	NA	3.9E+01 N	N/A	N/A	NO	BSL
	106-44-5	4-Methylphenol	8.0E-02 J	8.0E-02 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	8.0E-02	NA	3.9E+01 N	N/A	N/A	NO	BSL
	83-32-9	Acenaphthene	2.5E-02 J	1.3E-01 J	MG/KG	IS28SS36-0001	2/35	0.37 - 2.4	1.3E-01	NA	4.7E+02 N	1.0E+01	SSL	NO	BSL
	208-96-8	Acenaphthylene	2.2E-02 J	1.2E-01 J	MG/KG	IS28SS36-0001	4/35	0.37 - 2.4	1.2E-01	NA	1.6E+02 N	N/A	N/A	NO	BSL
	98-86-2	Acetophenone	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	1.0E-01	NA	7.8E+02 N	3.2E-01	SSL	NO	BSL
	120-12-7	Anthracene	3.3E-02 J	1.2E-01 J	MG/KG	IS28SS36-0001	4/35	0.37 - 2.4	1.2E-01	NA	2.3E+03 N	4.7E+01	SSL	NO	BSL
	1912-24-9	Atrazine	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	1.0E-01	NA	2.9E+00 C	8.8E-03	SSL	NO	BSL
	100-52-7	Benzaldehyde	1.5E-01 J	1.5E-01 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	1.5E-01	NA	7.8E+02 N	N/A	N/A	NO	BSL
	56-55-3	Benzo(a)anthracene	2.1E-02 J	5.4E-01	MG/KG	IS28SS15-0001	20/35	0.37 - 2.4	5.4E-01	NA	8.7E-01 C	1.5E+00	SSL	NO	BSL
	50-32-8	Benzo(a)pyrene	3.2E-02 J	8.1E-01	MG/KG	IS28SS15-0001	18/35	0.37 - 2.4	8.1E-01	NA	8.7E-02 C	3.7E-01	SSL	YES	ASL
	205-99-2	Benzo(b)fluoranthene	2.4E-02 J	1.7E+00	MG/KG	IS28SS15-0001	23/35	0.37 - 2.4	1.7E+00	NA	8.7E-01 C	4.5E+00	SSL	YES	ASL
	191-24-2	Benzo(g,h,i)perylene	2.8E-02 J	5.4E-01 J	MG/KG	IS28SS42-0001	9/35	0.37 - 2.4	5.4E-01	NA	2.3E+02 N	N/A	N/A	NO	BSL

Table 2.3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Remedial Investigation Report Site 28
IHDIV-NSWC

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	207-08-9	Benzo(k)fluoranthene	1.9E-02 J	6.6E-01	MG/KG	IS28SS15-0001	16/35	0.37 - 2.4	6.6E-01	NA	8.7E+00 C	4.5E+01	SSL	NO	BSL
	111-44-4	Bis(2-chloro-1-methylethyl) ether	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	1.0E-01	NA	5.8E-01 C	N/A	N/A	NO	BSL
	85-68-7	Butylbenzylphthalate	4.5E-02 J	3.4E-01 J	MG/KG	IS28SS06-0001	5/35	0.37 - 2.4	3.4E-01	NA	1.6E+03 N	1.7E+03	SSL	NO	BSL
	105-60-2	Caprolactam	8.6E-02 J	8.6E-02 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	8.6E-02	NA	3.9E+03 N	N/A	N/A	NO	BSL
	86-74-8	Carbazole	2.2E-02 J	1.4E-01 J	MG/KG	IS28SS36-0001	3/35	0.37 - 2.4	1.4E-01	NA	3.2E+01 C	4.7E-01	SSL	NO	BSL
	218-01-9	Chrysene	2.3E-02 J	6.2E-01	MG/KG	IS28SS15-0001	22/35	0.37 - 2.4	6.2E-01	NA	8.7E+01 C	1.5E+02	SSL	NO	BSL
	84-74-2	Di-n-butylphthalate	3.1E-02 J	5.5E-01	MG/KG	IS28SS20-0001	7/35	0.37 - 2.4	5.5E-01	NA	7.8E+02 N	5.0E+02	SSL	NO	BSL
	117-84-0	Di-n-octylphthalate	1.2E-01 J	1.2E-01 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	1.2E-01	NA	1.6E+02 N	4.9E+05	SSL	NO	BSL
	53-70-3	Dibenz(a,h)anthracene	2.9E-02 J	5.0E-01 J	MG/KG	IS28SS42-0001	8/35	0.37 - 2.4	5.0E-01	NA	8.7E-02 C	1.4E+00	SSL	YES	ASL
	132-64-9	Dibenzofuran	5.2E-02 J	1.2E-01 J	MG/KG	IS28SS36-0001	2/35	0.37 - 2.4	1.2E-01	NA	1.6E+01 N	3.8E-01	SSL	NO	BSL
	84-66-2	Diethylphthalate	2.3E-02 J	1.6E-01 J	MG/KG	IS28SS19-0001	6/35	0.37 - 2.4	1.6E-01	NA	6.3E+03 N	4.5E+01	SSL	NO	BSL
	131-11-3	Dimethyl phthalate	1.1E-01 J	1.1E-01 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	1.1E-01	NA	7.8E+04 N	N/A	N/A	NO	BSL
	206-44-0	Fluoranthene	2.0E-02 J	8.5E-01	MG/KG	IS28SS17-0001	26/35	0.37 - 2.4	8.5E-01	NA	3.1E+02 N	6.3E+02	SSL	NO	BSL
	86-73-7	Fluorene	1.2E-01 J	1.2E-01 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	1.2E-01	NA	3.1E+02 N	1.4E+01	SSL	NO	BSL
	118-74-1	Hexachlorobenzene	1.3E-01 J	1.3E-01 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	1.3E-01	NA	4.0E-01 C	5.2E-02	SSL	NO	BSL
	87-68-3	Hexachlorobutadiene	1.2E-01 J	1.2E-01 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	1.2E-01	NA	1.6E+00 NI	1.8E+00	SSL	NO	BSL
	77-47-4	Hexachlorocyclopentadiene	7.9E-02 J	7.9E-02 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	7.9E-02	NA	4.7E+01 N	1.8E+02	SSL	NO	BSL
	67-72-1	Hexachloroethane	9.5E-02 J	9.5E-02 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	9.5E-02	NA	7.8E+00 NI	3.6E-01	SSL	NO	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	3.0E-02 J	1.1E+00	MG/KG	IS28SS15-0001	17/35	0.37 - 2.4	1.1E+00	NA	8.7E-01 C	1.3E+01	SSL	YES	ASL
	78-59-1	Isophorone	1.1E-01 J	1.1E-01 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	1.1E-01	NA	6.7E+02 C	4.1E-01	SSL	NO	BSL
	91-20-3	Naphthalene	1.1E-01 J	1.1E-01 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	1.1E-01	NA	1.6E+02 N	1.5E-02	SSL	NO	BSL
	98-95-3	Nitrobenzene	1.2E-01 L	1.2E-01 L	MG/KG	IS28SS06-0001	1/35	0.37 - 2.4	1.2E-01	NA	3.9E+00 N	2.3E-03	SSL	NO	BSL
	87-86-5	Pentachlorophenol	1.3E-01 J	1.3E-01 J	MG/KG	IS28SS36-0001	1/35	0.93 - 6	1.3E-01	NA	5.3E+00 C	N/A	N/A	NO	BSL
	85-01-8	Phenanthrene	2.2E-02 J	7.4E-01	MG/KG	IS28SS17-0001	16/35	0.37 - 2.4	7.4E-01	NA	2.3E+02 N	6.8E+01	SSL	NO	BSL
	108-95-2	Phenol	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	1.0E-01	NA	2.3E+03 N	6.7E+00	SSL	NO	BSL
	129-00-0	Pyrene	2.2E-02 J	5.5E-01	MG/KG	IS28SS17-0001	26/35	0.37 - 2.4	5.5E-01	NA	2.3E+02 N	6.8E+01	SSL	NO	BSL
	111-91-1	bis(2-Chloroethoxy)methane	1.1E-01 J	1.1E-01 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	1.1E-01	NA	9.1E+00 C	N/A	N/A	NO	BSL
	111-44-4	bis(2-Chloroethyl)ether	1.1E-01 J	1.1E-01 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	1.1E-01	NA	5.8E-01 C	4.4E-05	SSL	NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	1.2E-01 J	3.3E-01 J	MG/KG	IS28SS21-0001P	7/35	0.37 - 2.4	3.3E-01	6.4E+02	4.6E+01 C	2.9E+03	SSL	NO	BSL
	621-64-7	n-Nitroso-di-n-propylamine	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/35	0.37 - 2.4	1.0E-01	NA	9.1E-02 C	4.7E-05	SSL	YES	ASL
	86-30-6	n-Nitrosodiphenylamine	2.3E-02 J	1.2E+01	MG/KG	IS28SS19-0001	10/35	0.37 - 2.4	1.2E+01	NA	1.3E+02 C	7.6E-01	SSL	NO	BSL
	99-35-4	1,3,5-Trinitrobenzene	6.7E-01	6.7E-01	MG/KG	IS28SS11-0001P	1/35	0.1 - 0.1	6.7E-01	NA	2.3E+02 N	N/A	N/A	NO	BSL
	118-96-7	2,4,6-Trinitrotoluene	1.2E-01 L	4.5E-01 L	MG/KG	IS28SS24-0001	4/35	0.1 - 0.1	4.5E-01	NA	3.9E+00 NI	N/A	N/A	NO	BSL
	121-14-2	2,4-Dinitrotoluene	7.9E-02 J	2.3E-01	MG/KG	IS28SS24-0001	4/35	0.1 - 0.1	2.3E-01	NA	1.6E+01 N	5.7E-03	SSL	NO	BSL
	2691-41-0	HMX	2.3E-01	2.3E-01	MG/KG	IS28SS37-0001	1/35	0.2 - 0.2	2.3E-01	NA	3.9E+02 N	N/A	N/A	NO	BSL
	98-95-3	Nitrobenzene	5.7E-02 J	1.9E-01 L	MG/KG	IS28SS42-0001	8/35	0.1 - 0.1	1.9E-01	NA	3.9E+00 N	2.3E-04	SSL	NO	BSL
	479-45-8	Tetryl	1.4E-01 J	6.2E-01	MG/KG	IS28SS24-0001	2/35	0.2 - 0.2	6.2E-01	NA	7.8E+01 N	N/A	N/A	NO	BSL

Table 2.3
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Remedial Investigation Report Site 28
IHDIV-NSWC

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	7429-90-5	Aluminum	1.5E+03	1.3E+04	MG/KG	IS28SS22-0001	35/35	28 - 98	1.3E+04	1.8E+04	7.8E+03 N	N/A	N/A	YES	ASL
	7440-36-0	Antimony	6.7E-01 J	1.8E+01 L	MG/KG	IS28SS19-0001	6/19	8.4 - 29	1.8E+01	NA	3.1E+00 N	1.3E+00	SSL	YES	ASL
	7440-38-2	Arsenic	2.8E+00 L	3.8E+02 L	MG/KG	IS28SS04-0001	35/35	1.4 - 4.9	3.8E+02	4.3E+00	4.3E-01 C	2.6E-02	SSL	YES	ASL
	7440-39-3	Barium	1.3E+01 J	1.6E+03	MG/KG	IS28SS19-0001	35/35	28 - 98	1.6E+03	1.4E+02	5.5E+02 N	2.1E+02	SSL	YES	ASL
	7440-41-7	Beryllium	6.0E-01 J	2.0E+00 J	MG/KG	IS28SS22-0001	3/35	0.7 - 2.4	2.0E+00	9.1E-01	1.6E+01 N	1.2E+02	SSL	NO	BSL
	7440-43-9	Cadmium	3.2E-01 J	1.4E+02	MG/KG	IS28SS19-0001	25/35	0.7 - 2.4	1.4E+02	2.6E-01	7.8E+00 N	5.5E+00	SSL	YES	ASL
	7440-70-2	Calcium	8.8E+01 J	2.4E+04	MG/KG	IS28SS10-0001	35/35	700 - 2400	2.4E+04	4.1E+02	NA	N/A	N/A	NO	NUT
	7440-47-3	Chromium	3.2E+00 J	1.7E+02	MG/KG	IS28SS19-0001	35/35	1.4 - 4.9	1.7E+02	2.4E+01	2.3E+01 N	4.2E+00	SSL	YES	ASL
	7440-48-4	Cobalt	9.7E-01 J	1.3E+01 J	MG/KG	IS28SS41-0001	35/35	7 - 24	1.3E+01	4.0E+01	1.6E+02 N	N/A	N/A	NO	BSL
	7440-50-8	Copper	5.3E+00 K	1.3E+03	MG/KG	IS28SS19-0001	35/35	3.5 - 12	1.3E+03	1.9E+01	3.1E+02 N	1.1E+03	SSL	YES	ASL
	7439-89-6	Iron	4.2E+03	8.5E+04	MG/KG	IS28SS10-0001	35/35	14 - 49	8.5E+04	4.3E+04	2.3E+03 N	N/A	N/A	YES	ASL
	7439-92-1	Lead	1.1E+01 K	1.0E+04 J	MG/KG	IS28SS19-0001	35/35	0.43 - 31	1.4E+02	1.5E+02	4.0E+02	N/A	N/A	NO	BSL
	7439-95-4	Magnesium	1.5E+02 J	2.6E+03	MG/KG	IS28SS19-0001	35/35	700 - 2400	2.6E+03	1.4E+03	NA	N/A	N/A	NO	NUT
	7439-96-5	Manganese	2.3E+01 J	7.1E+02 J	MG/KG	IS28SS10-0001	35/35	2.1 - 7.3	7.1E+02	2.2E+03	1.6E+02 N	9.5E+01	SSL	YES	ASL
	7439-97-6	Mercury	1.2E-01 K	1.2E+01	MG/KG	IS28SS15-0001	16/35	0.077 - 0.42	1.2E+01	8.7E-02	2.3E+00 N	N/A	N/A	YES	ASL
	7440-02-0	Nickel	2.8E+00 J	4.4E+01	MG/KG	IS28SS19-0001	26/35	5.6 - 20	4.4E+01	1.8E+01	1.6E+02 N	N/A	N/A	NO	BSL
	7440-09-7	Potassium	2.2E+02 J	1.3E+03 J	MG/KG	IS28SS22-0001	30/35	700 - 2400	1.3E+03	1.9E+03	NA	N/A	N/A	NO	NUT
	7782-49-2	Selenium	3.3E-01 J	1.3E+00 J	MG/KG	IS28SS10-0001	10/35	0.7 - 2.4	1.3E+00	1.1E+00	3.9E+01 N	1.9E+00	SSL	NO	BSL
	7440-22-4	Silver	9.4E-01 J	1.6E+01	MG/KG	IS28SS10-0001	10/35	1.4 - 4.9	1.6E+01	NA	3.9E+01 N	3.1E+00	SSL	NO	BSL
	7440-23-5	Sodium	9.9E+01 J	1.2E+02 J	MG/KG	IS28SS40-0001P	3/35	700 - 2400	1.2E+02	5.2E+01	NA	N/A	N/A	NO	NUT
	7440-62-2	Vanadium	9.8E+00 J	7.0E+01	MG/KG	IS28SS10-0001	35/35	7 - 24	7.0E+01	5.4E+01	2.3E+00 N	2.2E+01	SSL	YES	ASL
	7440-66-6	Zinc	4.4E+01	7.2E+04 L	MG/KG	IS28SS08-0001	35/35	2.9 - 390	7.2E+04	3.8E+01	2.3E+03 N	1.4E+03	SSL	YES	ASL

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening, except for lead where used average value.

[3] Background values are 95% UTL from Background Investigation Report.

[4] Risk-Based Concentration Table, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard. Residential Soil RBC.
RBC value for 2-chlorophenol used as surrogate for 2-nitrophenol and 4-chloro-3-methylphenol.
RBC value for methoxychlor used as surrogate for 4-bromophenyl-phenylether, and 4-chlorophenyl-phenylether.
RBC value for bis(2-chloroethyl)ether used as surrogate for bis(2-chloro-1-methylethyl) ether.
RBC value for bis(2-chloro) isopropyl ehter used as surrogate for bis(2-chloroethoxy) methane.
RBC value for pyrene used as surrogate for phenanthrene and benzo(g,h,i)perylene.
RBC value for naphthalene used as surrogate for acenaphthylene.
RBC value for chromium VI used for total chromium.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.
RBC value for manganese-nonfood used as surrogate for manganese.
RBC value for mercuric chloride used as surrogate for mercury.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
SSL = Region III Soil Screening Level, for groundwater migration, DAF 20
Cancer benchmark value = 1E-06, adjusted HQ=0.1
(EPA Region III RBC Table)

Table 2.4
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Emissions from Site 28 Surface Soil	540-59-0	1,2-Dichloroethene (total)	2.7E-04 L	8.0E-04 L	ug/m3	IS28SS33-0001	8/15		8.0E-04	NA	3.3E+00 N	NA	NA	NO	BSL
	98-82-8	Cumene	1.5E-03 J	1.5E-03 J	ug/m3	IS28SS41-0001	1/35		1.5E-03	NA	4.0E+01 N	NA	NA	NO	BSL
	79-20-9	Methyl acetate	4.5E-09 J	4.5E-09 J	ug/m3	IS28SS37-0001	1/35		4.5E-09	NA	3.7E+02 N	NA	NA	NO	BSL
	1634-04-4	Methyl-tert-butyl ether (MTBE)	6.6E-05 J	1.8E-03 L	ug/m3	IS28SS33-0001	19/35		1.8E-03	NA	1.6E+00 C	NA	NA	NO	BSL
	100-42-5	Styrene	5.2E-04 J	5.2E-04 J	ug/m3	IS28SS27-0001	1/35		5.2E-04	NA	1.0E+02 N	NA	NA	NO	BSL
	1330-20-7	Xylene, total	2.8E-04 J	2.8E-04 J	ug/m3	IS28SS21-0001P	1/35		2.8E-04	NA	1.1E+01 N	NA	NA	NO	BSL
	156-59-2	cis-1,2-Dichloroethene	2.7E-04 L	8.0E-04 L	ug/m3	IS28SS33-0001	8/35		8.0E-04	NA	3.7E+00 N	NA	NA	NO	BSL
	92-52-4	1,1-Biphenyl	5.5E-04 J	5.5E-04 J	ug/m3	IS28SS36-0001	1/35		5.5E-04	NA	1.8E+01 N	NA	NA	NO	BSL
	95-95-4	2,4,5-Trichlorophenol	9.8E-08 J	9.8E-08 J	ug/m3	IS28SS36-0001	1/35		9.8E-08	NA	3.7E+01 N	NA	NA	NO	BSL
	88-06-2	2,4,6-Trichlorophenol	7.6E-08 J	7.6E-08 J	ug/m3	IS28SS36-0001	1/35		7.6E-08	NA	6.3E-01 C	NA	NA	NO	BSL
	120-83-2	2,4-Dichlorophenol	7.6E-08 J	7.6E-08 J	ug/m3	IS28SS36-0001	1/35		7.6E-08	NA	1.1E+00 N	NA	NA	NO	BSL
	105-67-9	2,4-Dimethylphenol	5.8E-08 J	5.8E-08 J	ug/m3	IS28SS36-0001	1/35		5.8E-08	NA	7.3E+00 N	NA	NA	NO	BSL
	121-14-2	2,4-Dinitrotoluene	7.6E-08 J	9.1E-07 J	ug/m3	IS28SS10-0001	3/35		9.1E-07	NA	7.3E-01 N	NA	NA	NO	BSL
	606-20-2	2,6-Dinitrotoluene	8.3E-08 J	8.3E-08 J	ug/m3	IS28SS36-0001	1/35		8.3E-08	NA	3.7E-01 N	NA	NA	NO	BSL
	91-58-7	2-Chloronaphthalene	1.1E-03 J	1.1E-03 J	ug/m3	IS28SS36-0001	1/35		1.1E-03	NA	2.9E+01 N	NA	NA	NO	BSL
	95-57-8	2-Chlorophenol	2.6E-03 J	2.6E-03 J	ug/m3	IS28SS36-0001	1/35		2.6E-03	NA	1.8E+00 N	NA	NA	NO	BSL
	91-57-6	2-Methylnaphthalene	2.0E-03 J	2.0E-03 J	ug/m3	IS28SS36-0001	1/35		2.0E-03	NA	7.3E+00 N	NA	NA	NO	BSL
	95-48-7	2-Methylphenol	3.2E-04 J	3.2E-04 J	ug/m3	IS28SS36-0001	1/35		3.2E-04	NA	1.8E+01 N	NA	NA	NO	BSL
	88-74-4	2-Nitroaniline	4.8E-08 J	4.8E-08 J	ug/m3	IS28SS36-0001	1/35		4.8E-08	NA	2.1E-02 N	NA	NA	NO	BSL
	88-75-5	2-Nitrophenol	7.6E-08 J	7.6E-08 J	ug/m3	IS28SS36-0001	1/35		7.6E-08	NA	1.8E+00 N	NA	NA	NO	BSL
	534-52-1	4,6-Dinitro-2-methylphenol	7.4E-08 J	7.4E-08 J	ug/m3	IS28SS36-0001	1/35		7.4E-08	NA	3.7E-02 N	NA	NA	NO	BSL
	101-55-3	4-Bromophenyl-phenylether	9.1E-08 J	9.1E-08 J	ug/m3	IS28SS36-0001	1/35		9.1E-08	NA	1.8E+00 N	NA	NA	NO	BSL
	59-50-7	4-Chloro-3-methylphenol	6.2E-08 J	6.2E-08 J	ug/m3	IS28SS36-0001	1/35		6.2E-08	NA	1.8E+00 N	NA	NA	NO	BSL
	7005-72-3	4-Chlorophenyl-phenylether	9.1E-08 J	9.1E-08 J	ug/m3	IS28SS36-0001	1/35		9.1E-08	NA	1.8E+00 N	NA	NA	NO	BSL
	106-44-5	4-Methylphenol	6.1E-08 J	6.1E-08 J	ug/m3	IS28SS36-0001	1/35		6.1E-08	NA	1.8E+00 N	NA	NA	NO	BSL
	83-32-9	Acenaphthene	8.8E-05 J	4.6E-04 J	ug/m3	IS28SS36-0001	2/35		4.6E-04	NA	2.2E+01 N	NA	NA	NO	BSL
	208-96-8	Acenaphthylene	1.7E-08 J	9.1E-08 J	ug/m3	IS28SS39-0001	4/35		9.1E-08	NA	3.3E-01 N	NA	NA	NO	BSL
	98-86-2	Acetophenone	7.6E-08 J	7.6E-08 J	ug/m3	IS28SS36-0001	1/35		7.6E-08	NA	2.1E-03 N	NA	NA	NO	BSL
	120-12-7	Anthracene	2.5E-08 J	9.1E-08 J	ug/m3	IS28SS34-0001	4/35		9.1E-08	NA	1.1E+02 N	NA	NA	NO	BSL
	1912-24-9	Atrazine	7.6E-08 J	7.6E-08 J	ug/m3	IS28SS36-0001	1/35		7.6E-08	NA	2.8E-02 C	NA	NA	NO	BSL
	100-52-7	Benzaldehyde	1.1E-07 J	1.1E-07 J	ug/m3	IS28SS36-0001	1/35		1.1E-07	NA	3.7E+01 N	NA	NA	NO	BSL
	56-55-3	Benzo(a)anthracene	1.6E-08 J	4.1E-07	ug/m3	IS28SS34-0001 IS28SS39-0001	20/35		4.1E-07	NA	8.6E-03 C	NA	NA	NO	BSL
	50-32-8	Benzo(a)pyrene	2.4E-08 J	6.1E-07	ug/m3	IS28SS39-0001	18/35		6.1E-07	NA	2.0E-03 C	NA	NA	NO	BSL
	205-99-2	Benzo(b)fluoranthene	1.8E-08 J	1.3E-06	ug/m3	IS28SS34-0001	23/35		1.3E-06	NA	8.6E-03 C	NA	NA	NO	BSL
	191-24-2	Benzo(g,h,i)perylene	2.1E-08 J	4.1E-07 J	ug/m3	IS28SS42-0001	9/35		4.1E-07	NA	1.1E+01 N	NA	NA	NO	BSL
	207-08-9	Benzo(k)fluoranthene	1.4E-08 J	5.0E-07	ug/m3	IS28SS34-0001	16/35		5.0E-07	NA	8.6E-02 C	NA	NA	NO	BSL
	108-60-1	Bis(2-chloro-1-methylethyl) ether	7.6E-08 J	7.6E-08 J	ug/m3	IS28SS36-0001	1/35		7.6E-08	NA	5.7E-03 C	NA	NA	NO	BSL
	85-68-7	Butylbenzylphthalate	3.4E-08 J	2.6E-07 J	ug/m3	IS28SS01-0001	5/35		2.6E-07	NA	7.3E+01 N	NA	NA	NO	BSL
	105-60-2	Caprolactam	6.5E-08 J	6.5E-08 J	ug/m3	IS28SS36-0001	1/35		6.5E-08	NA	1.8E+02 N	NA	NA	NO	BSL
	86-74-8	Carbazole	1.7E-08 J	1.1E-07 J	ug/m3	IS28SS36-0001	3/35		1.1E-07	NA	3.1E-01 C	NA	NA	NO	BSL

Table 2.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	218-01-9	Chrysene	1.7E-08 J	4.7E-07	ug/m3	IS28SS39-0001	22/35		4.7E-07	NA	8.6E-01 C	NA	NA	NO	BSL
	84-74-2	Di-n-butylphthalate	2.3E-08 J	4.2E-07	ug/m3	IS28SS20-0001	7/35		4.2E-07	NA	3.7E+01 N	NA	NA	NO	BSL
	117-84-0	Di-n-octylphthalate	9.1E-08 J	9.1E-08 J	ug/m3	IS28SS36-0001	1/35		9.1E-08	NA	7.3E+00 N	NA	NA	NO	BSL
	53-70-3	Dibenz(a,h)anthracene	2.2E-08 J	3.8E-07 J	ug/m3	IS28SS42-0001	8/35		3.8E-07	NA	8.6E-04 C	NA	NA	NO	BSL
	132-64-9	Dibenzofuran	2.0E-04 J	4.6E-04 J	ug/m3	IS28SS36-0001	2/35		4.6E-04	NA	7.3E-01 N	NA	NA	NO	BSL
	84-66-2	Diethylphthalate	1.7E-08 J	1.2E-07 J	ug/m3	IS28SS19-0001	6/35		1.2E-07	NA	2.9E+02 N	NA	NA	NO	BSL
	131-11-3	Dimethyl phthalate	8.3E-08 J	8.3E-08 J	ug/m3	IS28SS36-0001	1/35		8.3E-08	NA	3.7E+03 N	NA	NA	NO	BSL
	206-44-0	Fluoranthene	1.5E-08 J	6.4E-07	ug/m3	IS28SS39-0001	26/35		6.4E-07	NA	1.5E+01 N	NA	NA	NO	BSL
	86-73-7	Fluorene	1.8E-04 J	1.8E-04 J	ug/m3	IS28SS36-0001	1/35		1.8E-04	NA	1.5E+01 N	NA	NA	NO	BSL
	118-74-1	Hexachlorobenzene	9.8E-08 J	9.8E-08 J	ug/m3	IS28SS36-0001	1/35		9.8E-08	NA	3.9E-03 C	NA	NA	NO	BSL
	87-68-3	Hexachlorobutadiene	9.1E-08 J	9.1E-08 J	ug/m3	IS28SS36-0001	1/35		9.1E-08	NA	7.3E-02 N	NA	NA	NO	BSL
	77-47-4	Hexachlorocyclopentadiene	6.0E-08 J	6.0E-08 J	ug/m3	IS28SS36-0001	1/35		6.0E-08	NA	2.1E-02 N	NA	NA	NO	BSL
	67-72-1	Hexachloroethane	7.2E-08 J	7.2E-08 J	ug/m3	IS28SS36-0001	1/35		7.2E-08	NA	3.7E-01 N	NA	NA	NO	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	2.3E-08 J	8.3E-07	ug/m3	IS28SS15-0001	17/35		8.3E-07	NA	8.6E-03 C	NA	NA	NO	BSL
	78-59-1	Isophorone	8.3E-08 J	8.3E-08 J	ug/m3	IS28SS36-0001	1/35		8.3E-08	NA	6.6E+00 C	NA	NA	NO	BSL
	91-20-3	Naphthalene	1.5E-03 J	1.5E-03 J	ug/m3	IS28SS36-0001	1/35		1.5E-03	NA	3.3E-01 N	NA	NA	NO	BSL
	98-95-3	Nitrobenzene	2.1E-03 L	2.1E-03 L	ug/m3	IS28SS06-0001	1/35		2.1E-03	NA	2.2E-01 N	NA	NA	NO	BSL
	87-86-5	Pentachlorophenol	9.8E-08 J	9.8E-08 J	ug/m3	IS28SS36-0001	1/35		9.8E-08	NA	5.2E-02 C	NA	NA	NO	BSL
	85-01-8	Phenanthrene	1.7E-08 J	5.6E-07	ug/m3	IS28SS17-0001	16/35		5.6E-07	NA	1.1E+01 N	NA	NA	NO	BSL
	108-95-2	Phenol	7.6E-08 J	7.6E-08 J	ug/m3	IS28SS36-0001	1/35		7.6E-08	NA	1.1E+02 N	NA	NA	NO	BSL
	129-00-0	Pyrene	4.5E-06 J	1.1E-04	ug/m3	IS28SS34-0001	26/35		1.1E-04	NA	1.1E+01 N	NA	NA	NO	BSL
	111-91-1	bis(2-Chloroethoxy)methane	8.3E-08 J	8.3E-08 J	ug/m3	IS28SS36-0001	1/35		8.3E-08	NA	1.8E-01 C	NA	NA	NO	BSL
	111-44-4	bis(2-Chloroethyl)ether	2.6E-03 J	2.6E-03 J	ug/m3	IS28SS36-0001	1/35		2.6E-03	NA	5.7E-03 C	NA	NA	NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	5.2E-07 J	1.4E-06 J	ug/m3	IS28SS01-0001	7/35		1.4E-06	NA	4.5E-01 C	NA	NA	NO	BSL
	621-64-7	n-Nitroso-di-n-propylamine	7.6E-08 J	7.6E-08 J	ug/m3	IS28SS36-0001	1/35		7.6E-08	NA	8.9E-04 C	NA	NA	NO	BSL
	86-30-6	n-Nitrosodiphenylamine	1.7E-08 J	9.1E-06	ug/m3	IS28SS19-0001	10/35		9.1E-06	NA	1.3E+00 C	NA	NA	NO	BSL
	99-35-4	1,3,5-Trinitrobenzene	5.1E-07	5.1E-07	ug/m3	IS28SS11-0001P	1/35		5.1E-07	NA	1.1E+01 N	NA	NA	NO	BSL
	118-96-7	2,4,6-Trinitrotoluene	9.1E-08 L	3.4E-07 L	ug/m3	IS28SS24-0001	4/35		3.4E-07	NA	1.8E-01 N	NA	NA	NO	BSL
	121-14-2	2,4-Dinitrotoluene	6.0E-08 J	1.7E-07	ug/m3	IS28SS24-0001	4/35		1.7E-07	NA	7.3E-01 N	NA	NA	NO	BSL
	2691-41-0	HMX	1.7E-07	1.7E-07	ug/m3	IS28SS37-0001	1/35		1.7E-07	NA	1.8E+01 N	NA	NA	NO	BSL
	98-95-3	Nitrobenzene	4.3E-08 L	1.4E-07 L	ug/m3	IS28SS42-0001	8/35		1.4E-07	NA	2.2E-01 N	NA	NA	NO	BSL
	479-45-8	Tetryl	1.1E-07 J	4.7E-07	ug/m3	IS28SS24-0001	2/35		4.7E-07	NA	3.7E+00 N	NA	NA	NO	BSL
	7429-90-5	Aluminum	1.2E-03	9.9E-03	ug/m3	IS28SS22-0001	35/35		9.9E-03	NA	3.7E-01 N	NA	NA	NO	BSL
	7440-36-0	Antimony	5.1E-07 J	1.4E-05 L	ug/m3	IS28SS19-0001	6/19		1.4E-05	NA	1.5E-01 N	NA	NA	NO	BSL
	7440-38-2	Arsenic	2.1E-06 L	2.9E-04 L	ug/m3	IS28SS04-0001	35/35		2.9E-04	NA	4.1E-04 C	NA	NA	NO	BSL
	7440-39-3	Barium	1.0E-05 J	1.2E-03	ug/m3	IS28SS19-0001	35/35		1.2E-03	NA	5.1E-02 N	NA	NA	NO	BSL
	7440-41-7	Beryllium	4.5E-07 J	1.5E-06 J	ug/m3	IS28SS22-0001	3/35		1.5E-06	NA	7.5E-04 C	NA	NA	NO	BSL
	7440-43-9	Cadmium	2.4E-07 J	1.1E-04	ug/m3	IS28SS19-0001	25/35		1.1E-04	NA	9.9E-04 C	NA	NA	NO	BSL
	7440-70-2	Calcium	6.7E-05 J	1.8E-02	ug/m3	IS28SS10-0001	35/35		1.8E-02	NA	NA	NA	NA	NO	NUT
	7440-47-3	Chromium	2.4E-06 J	1.3E-04	ug/m3	IS28SS19-0001	35/35		1.3E-04	NA	1.5E-04 C	NA	NA	NO	BSL
	7440-48-4	Cobalt	7.3E-07 J	1.0E-05 J	ug/m3	IS28SS41-0001	35/35		1.0E-05	NA	6.4E-04 C	NA	NA	NO	BSL

Table 2.4
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	7440-50-8	Copper	4.0E-06 K	9.6E-04	ug/m^3	IS28SS19-0001	35/35		9.6E-04	NA	1.5E+01 N	NA	NA	NO	BSL
	7439-89-6	Iron	3.2E-03	6.4E-02	ug/m^3	IS28SS10-0001	35/35		6.4E-02	NA	1.1E+02 N	NA	NA	NO	BSL
	7439-92-1	Lead	8.1E-06 K	7.8E-03 J	ug/m^3	IS28SS19-0001	35/35		7.8E-03	NA	NA	NA	NA	NO	NTX
	7439-95-4	Magnesium	1.1E-04 J	2.0E-03	ug/m^3	IS28SS19-0001	35/35		2.0E-03	NA	NA	NA	NA	NO	NUT
	7439-96-5	Manganese	1.7E-05 J	5.4E-04 J	ug/m^3	IS28SS10-0001	35/35		5.4E-04	NA	5.2E-03 N	NA	NA	NO	BSL
	7439-97-6	Mercury	9.1E-08 K	8.7E-06	ug/m^3	IS28SS15-0001	16/35		8.7E-06	NA	3.1E-02 N	NA	NA	NO	BSL
	7440-02-0	Nickel	2.1E-06 J	3.3E-05	ug/m^3	IS28SS19-0001	26/35		3.3E-05	NA	7.3E+00 N	NA	NA	NO	BSL
	7440-09-7	Potassium	1.7E-04 J	9.9E-04 J	ug/m^3	IS28SS22-0001	30/35		9.9E-04	NA	NA	NA	NA	NO	NUT
	7782-49-2	Selenium	2.5E-07 J	9.8E-07 J	ug/m^3	IS28SS10-0001	10/35		9.8E-07	NA	1.8E+00 N	NA	NA	NO	BSL
	7440-22-4	Silver	7.1E-07 J	1.2E-05	ug/m^3	IS28SS10-0001	10/35		1.2E-05	NA	1.8E+00 N	NA	NA	NO	BSL
	7440-23-5	Sodium	7.5E-05 J	9.3E-05 J	ug/m^3	IS28SS40-0001P	3/35		9.3E-05	NA	NA	NA	NA	NO	NUT
	7440-62-2	Vanadium	7.4E-06 J	5.3E-05	ug/m^3	IS28SS10-0001	35/35		5.3E-05	NA	1.1E-01 N	NA	NA	NO	BSL
	7440-66-6	Zinc	3.4E-05	5.4E-02 L	ug/m^3	IS28SS08-0001	35/35		5.4E-02	NA	1.1E+02 N	NA	NA	NO	BSL

[1] Minimum/Maximum calculated air concentrations from soil concentrations. Air concentrations calculated as Cair = Csoil*1000*(1/PEF+1/VF)
VF only included in calculation for VOCs. VF calculated on Table 2.2A. PEF = 1.32E+09 m3/kg.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Risk-Based Concentration Table, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard. Ambient Air RBC.
RBC value for pyrene used as surrogate for phenanthrene and benzo(g,h,i)perylene.
RBC value for bis(2-chloroethyl)ether used as surrogate for bis(2-chloro-1-methylethyl) ether.
RBC value for 2-chlorophenol used as surrogate for 2-nitrophenol and 4-Chloro-3-methylphenol.
RBC value for methoxychlor used as surrogate for 4-bromophenyl-phenylether, and 4-chlorophenyl-phenylether.
RBC value for bis(2-chloro) isoprpyl ehter used as surrogate for bis(2-chloroethoxy) methane.
RBC value for naphthalene used as surrogate for acenaphthylene.
RBC value for Chromium VI used for total chromium.
RBC value for manganese-nonfood used as surrogate for manganese.
RBC value for mercuric chloride used as surrogate for mercury.

[5] Rationale Codes

Selection Reason:	Above Screening Levels (ASL)
Deletion Reason:	No Toxicity Information (NTX)
	Essential Nutrient (NUT)
	Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.4A

Calculation of Volatilization Factor - Surface Soil

Site 28 IHDIV-NSWC

Indian Head, Maryland

Chemical	Diffusivity in Air (D_i) (cm^2/s)	Henry's Law Constant (H') (unitless)	Diffusivity in Water (D_w) (cm^2/s)	Soil Organic Carbon Partition Coeff. (K_{oc}) (cm^3/g)	Soil Water Partition Coeff. ($K_d = K_{oc} \times F_{oc}$) ($g/cm^3$)	Solubility in Water (S) (mg/L)	Apparent Diffusivity (D_A) (cm^2/s)	Vo
Volatile Organics								
1,2-Dichloroethene (total)	7.36E-02	1.67E-01	1.13E-05	3.55E+01	2.13E-01	3.50E+03	1.90E-03	
Cumene	7.50E-02	4.72E-01	7.10E-06	2.20E+02	1.32E+00	6.10E+01	1.25E-03	
Methyl Acetate	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Methyl-tert-butyl ether (MTBE)	8.00E-02	2.41E-02	1.00E-05	6.00E+00	3.60E-02	1.50E+05	7.30E-04	
Styrene	7.10E-02	1.13E-01	8.00E-06	7.76E+02	4.66E+00	3.10E+02	8.93E-05	
Xylene, total	7.69E-02	3.14E-01	8.44E-06	3.89E+02	2.33E+00	1.85E+02	5.16E-04	
cis-1,2-Dichloroethene	7.36E-02	1.67E-01	1.13E-05	3.55E+01	2.13E-01	3.50E+03	1.90E-03	
Semivolatile Organics								
Biphenyl	4.04E-02	1.23E-02	8.20E-06	7.76E+03	4.66E+01	7.50E+00	5.68E-07	
2-Chloronaphthalene	3.47E-02	1.27E-02	8.80E-06	1.55E+03	9.30E+00	1.20E+01	2.50E-06	
2-Chlorophenol	5.01E-02	1.60E-02	9.46E-06	3.88E+02	2.33E+00	2.24E+04	1.76E-05	
2-Methylnaphthalene	5.60E-02	2.07E-02	7.84E-06	2.13E+03	1.28E+01	2.54E+01	4.80E-06	
2-Methylphenol	7.40E-02	4.92E-05	8.30E-06	9.12E+01	5.47E-01	2.60E+04	3.81E-07	
Acenaphthene	4.21E-02	6.36E-03	7.69E-06	7.08E+03	4.25E+01	4.24E+00	3.36E-07	
Anthracene	3.24E-02	2.67E-03	7.74E-06	2.95E+04	1.77E+02	4.34E-02	2.63E-08	
Dibenzofuran	6.19E-02	3.98E-03	1.00E-05	5.48E+03	3.29E+01	5.65E+00	4.00E-07	
Fluorene	3.63E-02	2.61E-03	7.88E-06	1.38E+04	8.28E+01	1.98E+00	6.15E-08	
Naphthalene	5.90E-02	1.98E-02	7.50E-06	2.00E+03	1.20E+01	3.10E+01	5.15E-06	
Nitrobenzene	7.60E-02	9.84E-04	8.60E-06	6.46E+01	3.88E-01	2.09E+03	8.28E-06	
Pyrene	2.72E-02	4.51E-04	7.24E-06	1.05E+05	6.30E+02	1.35E-01	1.11E-09	
bis(2-Chloroethyl)ether	6.92E-02	7.38E-04	7.53E-06	1.50E+01	9.00E-02	1.72E+04	1.46E-05	
bis(2-Ethylhexyl)phthalate	3.51E-02	4.18E-06	3.66E-06	1.51E+07	9.06E+04	3.40E-01	3.43E-13	

Volatilization factor (VF) = (m^3/kg)

$$\frac{Q/C * (3.14 * D_A * T)^{1/2} * 10^{-4}\ m^2/cm^2}{2 * r_b * D_A}$$

Apparent Diffusivity (D_A) = (cm^2/s)

$$\frac{[(Q_a^{10/3} * D_i * H' + Q_w^{10/3} * D_w)/n^2]}{(r_b * K_d + Q_w + Q_a * H')}$$

Soil Saturation Concentration (C_{sat}) =

$$S/r_b * (K_d * r_b + Q_w + H' * Q_a)$$

Parameters	Values
Q/C - Inverse of the mean concentration at the center of a 0.5-acre-square source located in Philadelphia, PA (g/m^2-s per kg/m^3)	90.24
T - Exposure interval(s)	9.5E+08
r_b - Soil bulk density (g/cm^3)	1.5
Q_a - Air-filled soil porosity (L_{air}/L_{water}) = n - Q_w	0.28
n - Total soil porosity (Lpore/Lsoil) = 1 - (r_b/r_s)	0.43
Q_w - Water-filled soil porosity (Lwater/Lsoil)	0.15
r_s - Soil particle density (g/cm^3)	2.65
f_{oc} - fraction organic carbon in soil (g/g)	0.006

Equations and chemical properties from USEPA, 1996. *Soil Screening Guidance: User's Guide.* EPA/540/R-96/018.
Physical/chemical properties not listed in USEPA, 1996 obtained from USEPA Region 9 Preliminary Remediation Goal support tables, 2002.

Table 2.5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Mattawoman Creek	98-95-3	Nitrobenzene	1.5E-01 L	1.5E-01 L	UG/L	IS28SW02-0503	1/3	0.26 - 0.26	1.5E-01	NA	3.5E+00 N			NO	BSL
	7440-38-2	Arsenic	3.8E+00 J	3.8E+00 J	UG/L	IS28SW02-0503	1/3	10 - 10	3.8E+00	NA	4.5E-01 C			YES	ASL
	7440-39-3	Barium	3.5E+01 J	6.7E+01 J	UG/L	IS28SW01-0503	3/3	200 - 200	6.7E+01	NA	2.6E+03 N			NO	BSL
	7440-43-9	Cadmium	6.3E+00 J	7.6E+00 J	UG/L	IS28SW03-0503	3/3	5 - 5	7.6E+00	NA	1.8E+01 N			NO	BSL
	7440-70-2	Calcium	2.9E+03 J	6.3E+03 J	UG/L	IS28SW01-0503	3/3	5000 - 5000	6.3E+03	NA	NA			NO	NUT
	7440-48-4	Cobalt	6.3E-01 J	2.2E+00 J	UG/L	IS28SW02-0503	2/3	50 - 50	2.2E+00	NA	7.3E+02 N			NO	BSL
	7440-50-8	Copper	1.7E+01 J	1.7E+01 J	UG/L	IS28SW03-0503P	1/3	25 - 25	1.7E+01	NA	1.5E+03 N			NO	BSL
	7439-89-6	Iron	1.9E+02 J	6.6E+03 J	UG/L	IS28SW02-0503	2/3	100 - 100	6.6E+03	NA	1.1E+04 N			NO	BSL
	7439-92-1	Lead	6.2E+01	6.2E+01	UG/L	IS28SW02-0503	1/3	3 - 3	6.2E+01	NA	1.5E+01			YES	ASL
	7439-95-4	Magnesium	7.4E+02	1.8E+03	UG/L	IS28SW01-0503	3/3	5000 - 5000	1.8E+03	NA	NA			NO	NUT
	7439-96-5	Manganese	1.1E+01	4.6E+01	UG/L	IS28SW02-0503	3/3	15 - 15	4.6E+01	NA	7.3E+02 N			NO	BSL
	7440-02-0	Nickel	5.4E+00	1.0E+01	UG/L	IS28SW01-0503	2/3	40 - 40	1.0E+01	NA	7.3E+02 N			NO	BSL
	7440-09-7	Potassium	1.3E+03	1.3E+03	UG/L	IS28SW03-0503	1/3	5000 - 5000	1.3E+03	NA	NA			NO	NUT
	7440-23-5	Sodium	1.2E+04	2.2E+04	UG/L	IS28SW01-0503	3/3	5000 - 5000	2.2E+04	NA	NA			NO	NUT
	7440-66-6	Zinc	2.9E+03	4.1E+03	UG/L	IS28SW02-0503	3/3	20 - 20	4.1E+03	NA	1.1E+04 N			NO	BSL

[1] Minimum/Maximum detected concentration. Total metals results used since direct contact with surface water may occur.

[2] Maximum concentration is used for screening.

[3] Background values not available.

[4] Risk-Based Concentration Table, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard. Ten times Tap Water RBC.
Ten times the tap water RBC (Cancer benchmark value = 1E-06, adjusted HQ=0.1).
Lead screening toxicity value is 15 ug/L, the EPA tap water screening level for lead.
RBC value for manganese-nonfood used as surrogate for manganese.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.6
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Site 28 Soil*	540-59-0	1,2-Dichloroethene (total)	1.0E-03 L	3.0E-03 L	MG/KG	IS28SS33-0001	11/30	0.01 - 0.026	3.0E-03	NA	7.0E+01 N	3.7E-03	SSL	NO	BSL
	78-93-3	2-Butanone	4.0E-03 J	9.0E-03 J	MG/KG	IS28SB38-0103	2/70	0.01 - 0.026	9.0E-03	NA	4.7E+03 N	2.9E+00	SSL	NO	BSL
	67-64-1	Acetone	1.3E-02 J	3.1E-02	MG/KG	IS28SB08-0103	2/70	0.01 - 0.026	3.1E-02	1.8E+03	7.8E+02 N	2.2E+00	SSL	NO	BSL
	98-82-8	Cumene	7.0E-03 J	7.0E-03 J	MG/KG	IS28SS41-0001	1/70	0.01 - 0.026	7.0E-03	NA	7.8E+02 N	6.4E+00	SSL	NO	BSL
	100-41-4	Ethylbenzene	2.0E-03 J	2.0E-03 J	MG/KG	IS28SB32-0103	1/70	0.01 - 0.026	2.0E-03	NA	7.8E+02 N	1.5E+00	SSL	NO	BSL
	79-20-9	Methyl acetate	6.0E-03 J	6.0E-03 J	MG/KG	IS28SB32-0103 IS28SS37-0001	2/70	0.01 - 0.026	6.0E-03	NA	7.8E+03 N	2.5E+00	SSL	NO	BSL
	1634-04-4	Methyl-tert-butyl ether (MTBE)	4.0E-04 J	1.1E-02 L	MG/KG	IS28SS33-0001 IS28SB04-0103	36/70	0.01 - 0.026	1.1E-02	NA	1.6E+02 C	1.2E-02	SSL	NO	BSL
	75-09-2	Methylene chloride	1.0E-03 J	1.0E-03 J	MG/KG	IS28SB08-0103	1/70	0.01 - 0.026	1.0E-03	NA	8.5E+01 C	1.9E-02	SSL	NO	BSL
	100-42-5	Styrene	9.0E-03 J	9.0E-03 J	MG/KG	IS28SS27-0001	1/70	0.01 - 0.026	9.0E-03	NA	1.6E+03 N	5.7E+00	SSL	NO	BSL
	79-01-6	Trichloroethene	2.0E-02	2.0E-02	MG/KG	IS28SB20-0103 IS28SS40-0001P	1/70	0.01 - 0.026	2.0E-02	NA	1.6E+00 C	2.6E-04	SSL	NO	BSL
	1330-20-7	Xylene, total	2.0E-03 J	2.0E-03 J	MG/KG	IS28SS21-0001P	1/70	0.01 - 0.026	2.0E-03	NA	1.6E+03 N	3.0E-01	SSL	NO	BSL
	156-59-2	cis-1,2-Dichloroethene	1.0E-03 L	3.0E-03 L	MG/KG	IS28SS33-0001	11/70	0.01 - 0.026	3.0E-03	NA	7.8E+01 N	3.5E-03	SSL	NO	BSL
	92-52-4	1,1-Biphenyl	1.2E-01 J	1.2E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.2E-01	NA	3.9E+02 N	9.6E+00	SSL	NO	BSL
	95-95-4	2,4,5-Trichlorophenol	1.3E-01 J	1.3E-01 J	MG/KG	IS28SS36-0001	1/70	0.88 - 6	1.3E-01	NA	7.8E+02 N	N/A	N/A	NO	BSL
	88-06-2	2,4,6-Trichlorophenol	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.0E-01	NA	5.8E+01 C	N/A	N/A	NO	BSL
	120-83-2	2,4-Dichlorophenol	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.0E-01	NA	2.3E+01 N	1.2E-01	SSL	NO	BSL
	105-67-9	2,4-Dimethylphenol	7.7E-02 J	7.7E-02 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	7.7E-02	NA	1.6E+02 N	6.7E-01	SSL	NO	BSL
	121-14-2	2,4-Dinitrotoluene	1.0E-01 J	1.2E+00 J	MG/KG	IS28SS10-0001	4/70	0.35 - 2.4	1.2E+00	NA	1.6E+01 N	5.7E-03	SSL	NO	BSL
	606-20-2	2,6-Dinitrotoluene	1.1E-01 J	1.1E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.1E-01	NA	7.8E+00 N	2.5E-03	SSL	NO	BSL
	91-58-7	2-Chloronaphthalene	1.1E-01 J	1.1E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.1E-01	NA	6.3E+02 N	2.0E+00	SSL	NO	BSL
	95-57-8	2-Chlorophenol	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.0E-01	NA	3.9E+01 N	N/A	N/A	NO	BSL
	91-57-6	2-Methylnaphthalene	3.2E-02 J	1.5E-01 J	MG/KG	IS28SS36-0001	2/70	0.35 - 2.4	1.5E-01	NA	1.6E+02 N	N/A	N/A	NO	BSL
	95-48-7	2-Methylphenol	8.6E-02 J	8.6E-02 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	8.6E-02	NA	3.9E+02 N	N/A	N/A	NO	BSL
	88-74-4	2-Nitroaniline	6.4E-02 J	6.4E-02 J	MG/KG	IS28SS36-0001	1/70	0.88 - 6	6.4E-02	NA	2.3E+01 N	N/A	N/A	NO	BSL
	88-75-5	2-Nitrophenol	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.0E-01	NA	3.9E+01 N	N/A	N/A	NO	BSL
	534-52-1	4,6-Dinitro-2-methylphenol	9.8E-02 J	9.8E-02 J	MG/KG	IS28SS36-0001	1/70	0.88 - 6	9.8E-02	NA	7.8E-01 N	N/A	N/A	NO	BSL
	101-55-3	4-Bromophenyl-phenylether	1.2E-01 J	1.2E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.2E-01	NA	3.9E+01 N	N/A	N/A	NO	BSL
	59-50-7	4-Chloro-3-methylphenol	8.2E-02 J	8.2E-02 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	8.2E-02	NA	3.9E+01 N	N/A	N/A	NO	BSL
	7005-72-3	4-Chlorophenyl-phenylether	1.2E-01 J	1.2E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.2E-01	NA	3.9E+01 N	N/A	N/A	NO	BSL
	106-44-5	4-Methylphenol	8.0E-02 J	8.0E-02 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	8.0E-02	NA	3.9E+01 N	N/A	N/A	NO	BSL
	83-32-9	Acenaphthene	2.5E-02 J	1.3E-01 J	MG/KG	IS28SS36-0001	4/70	0.35 - 2.4	1.3E-01	NA	4.7E+02 N	1.0E+01	SSL	NO	BSL
	208-96-8	Acenaphthylene	2.2E-02 J	1.2E-01 J	MG/KG	IS28SS36-0001	6/70	0.35 - 2.4	1.2E-01	NA	1.6E+02 N	N/A	N/A	NO	BSL
	98-86-2	Acetophenone	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.0E-01	NA	7.8E+02 N	3.2E-01	SSL	NO	BSL

Table 2.6
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	120-12-7	Anthracene	2.6E-02 J	1.2E-01 J	MG/KG	IS28SS36-0001	7/70	0.35 - 2.4	1.2E-01	NA	2.3E+03 N	4.7E+01	SSL	NO	BSL
	1912-24-9	Atrazine	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.0E-01	NA	2.9E+00 C	8.8E-03	SSL	NO	BSL
	100-52-7	Benzaldehyde	2.6E-02 J	1.5E-01 J	MG/KG	IS28SS36-0001	4/70	0.35 - 2.4	1.5E-01	NA	7.8E+02 N	N/A	N/A	NO	BSL
	56-55-3	Benzo(a)anthracene	2.1E-02 J	5.4E-01	MG/KG	IS28SS15-0001	26/70	0.35 - 2.4	5.4E-01	NA	8.7E-01 C	1.5E+00	SSL	NO	BSL
	50-32-8	Benzo(a)pyrene	3.0E-02 J	8.1E-01	MG/KG	IS28SS15-0001	24/70	0.35 - 2.4	8.1E-01	NA	8.7E-02 C	3.7E-01	SSL	YES	ASL
	205-99-2	Benzo(b)fluoranthene	2.3E-02 J	1.7E+00	MG/KG	IS28SS15-0001	29/70	0.35 - 2.4	1.7E+00	NA	8.7E-01 C	4.5E+00	SSL	YES	ASL
	191-24-2	Benzo(g,h,i)perylene	1.5E-02 J	5.4E-01 J	MG/KG	IS28SS42-0001	16/70	0.35 - 2.4	5.4E-01	NA	2.3E+02 N	N/A	N/A	NO	BSL
	207-08-9	Benzo(k)fluoranthene	1.9E-02 J	6.6E-01	MG/KG	IS28SS15-0001	20/70	0.35 - 2.4	6.6E-01	NA	8.7E+00 C	4.5E+01	SSL	NO	BSL
	108-60-1	Bis(2-chloro-1-methylethyl) ether	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.0E-01	NA	5.8E-01 C	N/A	N/A	NO	BSL
	85-68-7	Butylbenzylphthalate	4.5E-02 J	3.4E-01 J	MG/KG	IS28SS06-0001	7/70	0.35 - 2.4	3.4E-01	NA	1.6E+03 N	1.7E+03	SSL	NO	BSL
	105-60-2	Caprolactam	8.6E-02 J	8.6E-02 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	8.6E-02	NA	3.9E+03 N	N/A	N/A	NO	BSL
	86-74-8	Carbazole	2.2E-02 J	1.4E-01 J	MG/KG	IS28SS36-0001	5/70	0.35 - 2.4	1.4E-01	NA	3.2E+01 C	4.7E-01	SSL	NO	BSL
	218-01-9	Chrysene	2.3E-02 J	6.2E-01	MG/KG	IS28SS15-0001	28/70	0.35 - 2.4	6.2E-01	NA	8.7E+01 C	1.5E+02	SSL	NO	BSL
	84-74-2	Di-n-butylphthalate	1.9E-02 J	6.4E-01	MG/KG	IS28SB22-0103	19/70	0.35 - 2.4	6.4E-01	NA	7.8E+02 N	5.0E+02	SSL	NO	BSL
	117-84-0	Di-n-octylphthalate	1.2E-01 J	1.2E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.2E-01	NA	1.6E+02 N	4.9E+05	SSL	NO	BSL
	53-70-3	Dibenz(a,h)anthracene	2.9E-02 J	5.0E-01 J	MG/KG	IS28SS42-0001	10/70	0.35 - 2.4	5.0E-01	NA	8.7E-02 C	1.4E+00	SSL	YES	ASL
	132-64-9	Dibenzofuran	2.2E-02 J	1.2E-01 J	MG/KG	IS28SS36-0001	4/70	0.35 - 2.4	1.2E-01	NA	1.6E+01 N	3.8E-01	SSL	NO	BSL
	84-66-2	Diethylphthalate	2.3E-02 J	1.6E-01 J	MG/KG	IS28SS19-0001	9/70	0.35 - 2.4	1.6E-01	NA	6.3E+03 N	4.5E+01	SSL	NO	BSL
	131-11-3	Dimethyl phthalate	1.1E-01 J	1.1E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.1E-01	NA	7.8E+04 N	N/A	N/A	NO	BSL
	206-44-0	Fluoranthene	2.0E-02 J	8.5E-01	MG/KG	IS28SS17-0001	32/70	0.35 - 2.4	8.5E-01	NA	3.1E+02 N	6.3E+02	SSL	NO	BSL
	86-73-7	Fluorene	5.8E-02 J	1.2E-01 J	MG/KG	IS28SS36-0001	3/70	0.35 - 2.4	1.2E-01	NA	3.1E+02 N	1.4E+01	SSL	NO	BSL
	118-74-1	Hexachlorobenzene	1.3E-01 J	1.3E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.3E-01	NA	4.0E-01 C	5.2E-02	SSL	NO	BSL
	87-68-3	Hexachlorobutadiene	1.2E-01 J	1.2E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.2E-01	NA	1.6E+00 N!	1.8E+00	SSL	NO	BSL
	77-47-4	Hexachlorocyclopentadiene	7.9E-02 J	7.9E-02 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	7.9E-02	NA	4.7E+01 N	1.8E+02	SSL	NO	BSL
	67-72-1	Hexachloroethane	9.5E-02 J	9.5E-02 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	9.5E-02	NA	7.8E+00 N!	3.6E-01	SSL	NO	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	3.0E-02 J	1.1E+00	MG/KG	IS28SS15-0001	22/70	0.35 - 2.4	1.1E+00	NA	8.7E-01 C	1.3E+01	SSL	YES	ASL
	78-59-1	Isophorone	1.1E-01 J	1.1E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.1E-01	NA	6.7E+02 C	4.1E-01	SSL	NO	BSL
	91-20-3	Naphthalene	2.5E-02 J	1.1E-01 J	MG/KG	IS28SS36-0001	3/70	0.35 - 2.4	1.1E-01	NA	1.6E+02 N	1.5E-02	SSL	NO	BSL
	98-95-3	Nitrobenzene	1.2E-01 L	1.2E-01 L	MG/KG	IS28SS06-0001	1/70	0.35 - 2.4	1.2E-01	NA	3.9E+00 N	2.3E-03	SSL	NO	BSL
	87-86-5	Pentachlorophenol	1.3E-01 J	1.3E-01 J	MG/KG	IS28SS36-0001	1/70	0.88 - 6	1.3E-01	NA	5.3E+00 C	N/A	N/A	NO	BSL
	85-01-8	Phenanthrene	2.1E-02 J	7.4E-01	MG/KG	IS28SS17-0001	22/70	0.35 - 2.4	7.4E-01	NA	2.3E+02 N	6.8E+01	SSL	NO	BSL
	108-95-2	Phenol	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.0E-01	NA	2.3E+03 N	6.7E+00	SSL	NO	BSL
	129-00-0	Pyrene	2.0E-02 J	7.4E-01	MG/KG	IS28SB42-0103	34/70	0.35 - 2.4	7.4E-01	NA	2.3E+02 N	6.8E+01	SSL	NO	BSL
	111-91-1	bis(2-Chloroethoxy)methane	1.1E-01 J	1.1E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.1E-01	NA	9.1E+00 C	N/A	N/A	NO	BSL

Table 2.6
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	111-44-4	bis(2-Chloroethyl)ether	1.1E-01 J	1.1E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.1E-01	NA	5.8E-01 C	4.4E-05	SSL	NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	5.8E-02 J	3.3E-01 J	MG/KG	IS28SS21-0001P	10/70	0.35 - 2.4	3.3E-01	6.4E+02	4.6E+01 C	2.9E+03	SSL	NO	BSL
	621-64-7	n-Nitroso-di-n-propylamine	1.0E-01 J	1.0E-01 J	MG/KG	IS28SS36-0001	1/70	0.35 - 2.4	1.0E-01	NA	9.1E-02 C	4.7E-05	SSL	YES	ASL
	86-30-6	n-Nitrosodiphenylamine	2.3E-02 J	1.2E+01	MG/KG	IS28SS19-0001	15/70	0.35 - 2.4	1.2E+01	NA	1.3E+02 C	7.6E-01	SSL	NO	BSL
	99-35-4	1,3,5-Trinitrobenzene	2.4E-01	6.7E-01	MG/KG	IS28SS11-0001P	3/70	0.1 - 0.1	6.7E-01	NA	2.3E+02 N	N/A	N/A	NO	BSL
	99-65-0	1,3-Dinitrobenzene	6.3E-02 J	6.3E-02 J	MG/KG	IS28SB08-0103	1/70	0.1 - 0.1	6.3E-02	NA	7.8E-01 N	3.7E-03	SSL	NO	BSL
	118-96-7	2,4,6-Trinitrotoluene	4.1E-02 J	4.5E-01 L	MG/KG	IS28SS24-0001	12/70	0.1 - 0.1	4.5E-01	NA	3.9E+00 N	N/A	N/A	NO	BSL
	121-14-2	2,4-Dinitrotoluene	6.7E-02 J	2.3E-01	MG/KG	IS28SS24-0001	5/70	0.1 - 0.1	2.3E-01	NA	1.6E+01 N	5.7E-03	SSL	NO	BSL
	2691-41-0	HMX	2.3E-01	2.3E-01	MG/KG	IS28SS37-0001	1/70	0.2 - 0.2	2.3E-01	NA	3.9E+02 N	N/A	N/A	NO	BSL
	98-95-3	Nitrobenzene	4.7E-02 L	2.6E-01 L	MG/KG	IS28SB19-0105	17/70	0.1 - 0.1	2.6E-01	NA	3.9E+00 N	2.3E-04	SSL	NO	BSL
	479-45-8	Tetryl	5.4E-02 J	6.2E-01	MG/KG	IS28SS24-0001	4/70	0.2 - 0.2	6.2E-01	NA	7.8E+01 N	N/A	N/A	NO	BSL
	7429-90-5	Aluminum	1.0E+03	1.5E+04	MG/KG	IS28SB06-0103	70/70	28 - 110	1.5E+04	1.8E+04	7.8E+03 N	N/A	N/A	YES	ASL
	7440-36-0	Antimony	6.7E-01 J	1.0E+02 L	MG/KG	IS28SB19-0105	7/30	8.4 - 34	1.0E+02	3.6E+00	3.1E+00 N	1.3E+00	SSL	YES	ASL
	7440-38-2	Arsenic	9.1E-01 J	3.8E+02 L	MG/KG	IS28SS04-0001	68/70	1.4 - 5.6	3.8E+02	4.3E+00	4.3E-01 C	2.6E-02	SSL	YES	ASL
	7440-39-3	Barium	1.3E+01 J	3.7E+03	MG/KG	IS28SB19-0105	70/70	28 - 110	3.7E+03	1.4E+02	5.5E+02 N	2.1E+02	SSL	YES	ASL
	7440-41-7	Beryllium	5.7E-01 J	2.0E+00 J	MG/KG	IS28SS22-0001	7/70	0.7 - 2.8	2.0E+00	9.1E-01	1.6E+01 N	1.2E+02	SSL	NO	BSL
	7440-43-9	Cadmium	3.2E-01 J	1.4E+02	MG/KG	IS28SS19-0001	36/70	0.7 - 2.8	1.4E+02	2.6E-01	7.8E+00 N	5.5E+00	SSL	YES	ASL
	7440-70-2	Calcium	4.9E+01 J	2.4E+04	MG/KG	IS28SS10-0001	70/70	700 - 2800	2.4E+04	2.0E+02	NA	N/A	N/A	NO	NUT
	7440-47-3	Chromium	1.6E+00 J	1.8E+02	MG/KG	IS28SB19-0105	69/70	1.4 - 5.6	1.8E+02	2.4E+01	2.3E+01 N	4.2E+00	SSL	YES	ASL
	7440-48-4	Cobalt	7.6E-01 J	1.9E+01 J	MG/KG	IS28SB19-0105	65/70	7 - 28	1.9E+01	4.0E+01	1.6E+02 N	N/A	N/A	NO	BSL
	7440-50-8	Copper	2.3E+00 J	2.3E+03	MG/KG	IS28SB19-0105	67/70	3.5 - 14	2.3E+03	1.9E+01	3.1E+02 N	1.1E+03	SSL	YES	ASL
	7439-89-6	Iron	1.3E+03	1.3E+05	MG/KG	IS28SB19-0105	70/70	14 - 56	1.3E+05	4.3E+04	2.3E+03 N	N/A	N/A	YES	ASL
	7439-92-1	Lead	3.6E+00	1.7E+04 J	MG/KG	IS28SB19-0105	70/70	0.43 - 42	5.9E+01	3.8E+01	4.0E+02	N/A	N/A	NO	BSL
	7439-95-4	Magnesium	9.5E+01 J	2.3E+04	MG/KG	IS28SB19-0105	70/70	700 - 2800	2.3E+04	4.3E+03	NA	N/A	N/A	NO	NUT
	7439-96-5	Manganese	4.2E+00 K	1.1E+03 J	MG/KG	IS28SB19-0105	70/70	2.1 - 8.4	1.1E+03	1.3E+03	1.6E+02 N	9.5E+01	SSL	YES	ASL
	7439-97-6	Mercury	1.2E-01 K	1.2E+01	MG/KG	IS28SS15-0001	20/70	0.068 - 0.42	1.2E+01	8.7E-02	2.3E+00 N	N/A	N/A	YES	ASL
	7440-02-0	Nickel	2.3E+00 J	2.5E+02	MG/KG	IS28SB19-0105	48/70	5.6 - 22	2.5E+02	1.8E+01	1.6E+02 N	N/A	N/A	YES	ASL
	7440-09-7	Potassium	8.9E+01 J	6.1E+03	MG/KG	IS28SB19-0105	60/70	700 - 2800	6.1E+03	1.9E+03	NA	N/A	N/A	NO	NUT
	7782-49-2	Selenium	3.3E-01 J	1.3E+00 J	MG/KG	IS28SS10-0001	13/70	0.7 - 2.8	1.3E+00	8.9E+00	3.9E+01 N	1.9E+00	SSL	NO	BSL
	7440-22-4	Silver	8.3E-01 J	1.6E+01	MG/KG	IS28SS10-0001	16/70	1.4 - 5.6	1.6E+01	6.3E-01	3.9E+01 N	3.1E+00	SSL	NO	BSL
	7440-23-5	Sodium	6.2E+01 J	1.6E+02 J	MG/KG	IS28SB12-0103	8/70	700 - 2800	1.6E+02	5.2E+01	NA	N/A	N/A	NO	NUT
	7440-28-0	Thallium	8.7E-01 J	8.7E-01 J	MG/KG	IS28SB22-0103	1/70	1.4 - 5.6	8.7E-01	3.1E+00	5.5E-01 N	3.6E-01	SSL	YES	ASL
	7440-62-2	Vanadium	3.0E+00 J	9.3E+01 J	MG/KG	IS28SB12-0103	70/70	7 - 28	9.3E+01	5.4E+01	5.5E+01 N	2.2E+01	SSL	YES	ASL
	7440-66-6	Zinc	7.4E+00 K	7.2E+04 L	MG/KG	IS28SS08-0001	70/70	2.8 - 390	7.2E+04	3.8E+01	2.3E+03 N	1.4E+03	SSL	YES	ASL

Table 2.6
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

* Surface soil & subsurface soil combined

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening, except for lead where used average value.

[3] Background values are the lesser of a comparison of the surface and subsurface soil 95% UTLs from Background Investigation Report.

[4] Risk-Based Concentration Table, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard. Residential Soil RBC.
RBC value for 2-chlorophenol used as surrogate for 2-nitrophenol and 4-chloro-3-methylphenol.
RBC value for methoxychlor used as surrogate for 4-bromophenyl-phenylether, and 4-chlorophenyl-phenylether.
RBC value for bis(2-chloroethyl)ether used as surrogate for bis(2-chloro-1-methylethyl) ether.
RBC value for bis(2-chloro) isopropyl ether used as surrogate for bis(2-chloroethoxy) methane.
RBC value for pyrene used as surrogate for phenanthrene and benzo(g,h,i)perylene.
RBC value for naphthalene used as surrogate for acenaphthylene.
RBC value for chromium VI used for total chromium.
Lead screening toxicity value is 400 mg/kg, the EPA residential soil screening level for lead.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
SSL = Region III Soil Screening Level, for groundwater migration, DAF 20
Cancer benchmark value = 1E-06, adjusted HQ=0.1
(EPA Region III RBC Table)

Table 2.7
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Emissions from Site 28 Soil*	540-59-0	1,2-Dichloroethene (total)	2.7E-04 L	8.0E-04 L	ug/m³	IS28SS33-0001	11/30		8.0E-04	NA	3.3E+00 N	NA	NA	NO	BSL
	78-93-3	2-Butanone	3.5E-05 J	7.9E-05 J	ug/m³	IS28SB38-0103	2/70		7.9E-05	NA	1.0E+02 N	NA	NA	NO	BSL
	67-64-1	Acetone	8.0E-04 J	1.9E-03	ug/m³	IS28SB08-0103	2/70		1.9E-03	NA	3.7E+01 N	NA	NA	NO	BSL
	98-82-8	Cumene	1.5E-03 J	1.5E-03 J	ug/m³	IS28SS41-0001	1/70		1.5E-03	NA	4.0E+01 N	NA	NA	NO	BSL
	100-41-4	Ethylbenzene	7.1E-04 J	7.1E-04 J	ug/m³	IS28SB32-0103	1/70		7.1E-04	NA	1.1E+02 N	NA	NA	NO	BSL
	79-20-9	Methyl acetate	4.55E-09 J	4.55E-09 J	ug/m³	IS28SB32-0103 IS28SS37-0001	2/70		4.5E-09	NA	3.7E+02 N	NA	NA	NO	BSL
	1634-04-4	Methyl-tert-butyl ether (MTBE)	6.6E-05 J	1.8E-03 L	ug/m³	IS28SS33-0001 IS28SB04-0103	36/70		1.8E-03	NA	1.6E+00 C	NA	NA	NO	BSL
	75-09-2	Methylene chloride	3.1E-04 J	3.1E-04 J	ug/m³	IS28SB08-0103	1/70		3.1E-04	NA	3.8E+00 C	NA	NA	NO	BSL
	100-42-5	Styrene	5.2E-04 J	5.2E-04 J	ug/m³	IS28SS27-0001	1/70		5.2E-04	NA	1.0E+02 N	NA	NA	NO	BSL
	79-01-6	Trichloroethene	4.7E-03	4.7E-03	ug/m³	IS28SB20-0103 IS28SS28-0001	1/70		4.7E-03	NA	1.6E-02 C	NA	NA	NO	BSL
	1330-20-7	Xylene, total	2.8E-04 J	2.8E-04 J	ug/m³	IS28SS21-0001P	1/70		2.8E-04	NA	1.1E+01 N	NA	NA	NO	BSL
	156-59-2	cis-1,2-Dichloroethene	2.7E-04 L	7.96E-04 L	ug/m³	IS28SS33-0001	11/70		8.0E-04	NA	3.7E+00 N	NA	NA	NO	BSL
	92-52-4	1,1-Biphenyl	5.5E-04 J	5.5E-04 J	ug/m³	IS28SS36-0001	1/70		5.5E-04	NA	1.8E+01 N	NA	NA	NO	BSL
	95-95-4	2,4,5-Trichlorophenol	9.85E-08 J	9.85E-08 J	ug/m³	IS28SS36-0001	1/70		9.8E-08	NA	3.7E+01 N	NA	NA	NO	BSL
	88-06-2	2,4,6-Trichlorophenol	7.58E-08 J	7.58E-08 J	ug/m³	IS28SS36-0001	1/70		7.6E-08	NA	6.3E-01 C	NA	NA	NO	BSL
	120-83-2	2,4-Dichlorophenol	7.58E-08 J	7.58E-08 J	ug/m³	IS28SS36-0001	1/70		7.6E-08	NA	1.1E+00 N	NA	NA	NO	BSL
	105-67-9	2,4-Dimethylphenol	5.83E-08 J	5.83E-08 J	ug/m³	IS28SS36-0001	1/70		5.8E-08	NA	7.3E+00 N	NA	NA	NO	BSL
	121-14-2	2,4-Dinitrotoluene	7.58E-08 J	9.09E-07 J	ug/m³	IS28SS10-0001	4/70		9.1E-07	NA	7.3E-01 N	NA	NA	NO	BSL
	606-20-2	2,6-Dinitrotoluene	8.33E-08 J	8.33E-08 J	ug/m³	IS28SS36-0001	1/70		8.3E-08	NA	3.7E-01 N	NA	NA	NO	BSL
	91-58-7	2-Chloronaphthalene	1.1E-03 J	1.1E-03 J	ug/m³	IS28SS36-0001	1/70		1.1E-03	NA	2.9E+01 N	NA	NA	NO	BSL
	95-57-8	2-Chlorophenol	2.6E-03 J	2.6E-03 J	ug/m³	IS28SS36-0001	1/70		2.6E-03	NA	1.8E+00 N	NA	NA	NO	BSL
	91-57-6	2-Methylnaphthalene	4.3E-04 J	2.0E-03 J	ug/m³	IS28SS36-0001	2/70		2.0E-03	NA	7.3E+00 N	NA	NA	NO	BSL
	95-48-7	2-Methylphenol	3.2E-04 J	3.2E-04 J	ug/m³	IS28SS36-0001	1/70		3.2E-04	NA	1.8E+01 N	NA	NA	NO	BSL
	88-74-4	2-Nitroaniline	4.85E-08 J	4.85E-08 J	ug/m³	IS28SS36-0001	1/70		4.8E-08	NA	2.1E-02 N	NA	NA	NO	BSL
	88-75-5	2-Nitrophenol	7.58E-08 J	7.58E-08 J	ug/m³	IS28SS36-0001	1/70		7.6E-08	NA	1.8E+00 N	NA	NA	NO	BSL
	534-52-1	4,6-Dinitro-2-methylphenol	7.42E-08 J	7.42E-08 J	ug/m³	IS28SS36-0001	1/70		7.4E-08	NA	3.7E-02 N	NA	NA	NO	BSL
	101-55-3	4-Bromophenyl-phenylether	9.09E-08 J	9.09E-08 J	ug/m³	IS28SS36-0001	1/70		9.1E-08	NA	1.8E+00 N	NA	NA	NO	BSL
	59-50-7	4-Chloro-3-methylphenol	6.21E-08 J	6.21E-08 J	ug/m³	IS28SS36-0001	1/70		6.2E-08	NA	1.8E+00 N	NA	NA	NO	BSL
	7005-72-3	4-Chlorophenyl-phenylether	9.09E-08 J	9.09E-08 J	ug/m³	IS28SS36-0001	1/70		9.1E-08	NA	1.8E+00 N	NA	NA	NO	BSL
	106-44-5	4-Methylphenol	6.06E-08 J	6.06E-08 J	ug/m³	IS28SS36-0001	1/70		6.1E-08	NA	1.8E+00 N	NA	NA	NO	BSL
	83-32-9	Acenaphthene	8.8E-05 J	4.6E-04 J	ug/m³	IS28SS36-0001	4/70		4.6E-04	NA	2.2E+01 N	NA	NA	NO	BSL
	208-96-8	Acenaphthylene	1.67E-08 J	9.09E-08 J	ug/m³	IS28SS39-0001	6/70		9.1E-08	NA	3.3E-01 N	NA	NA	NO	BSL
	98-86-2	Acetophenone	7.58E-08 J	7.58E-08 J	ug/m³	IS28SS36-0001	1/70		7.6E-08	NA	2.1E-03 N	NA	NA	NO	BSL
	120-12-7	Anthracene	2.6E-05 J	1.2E-04 J	ug/m³	IS28SS34-0001	7/70		1.2E-04	NA	1.1E+02 N	NA	NA	NO	BSL
	1912-24-9	Atrazine	7.58E-08 J	7.58E-08 J	ug/m³	IS28SS36-0001	1/70		7.6E-08	NA	2.8E-02 C	NA	NA	NO	BSL

Table 2.7
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	100-52-7	Benzaldehyde	2.0E-08 J	1.14E-07 J	ug/m^3	IS28SS36-0001	4/70		1.1E-07	NA	3.7E+01 N	NA	NA	NO	BSL
	56-55-3	Benzo(a)anthracene	1.59E-08 J	4.09E-07	ug/m^3	IS28SS34-0001 IS28SS39-0001	26/70		4.1E-07	NA	8.6E-03 C	NA	NA	NO	BSL
	50-32-8	Benzo(a)pyrene	2.27E-08 J	6.14E-07	ug/m^3	IS28SS39-0001	24/70		6.1E-07	NA	2.0E-03 C	NA	NA	NO	BSL
	205-99-2	Benzo(b)fluoranthene	1.74E-08 J	1.29E-06	ug/m^3	IS28SS34-0001	29/70		1.3E-06	NA	8.6E-03 C	NA	NA	NO	BSL
	191-24-2	Benzo(g,h,i)perylene	1.14E-08 J	4.09E-07 J	ug/m^3	IS28SS42-0001	16/70		4.1E-07	NA	1.1E+01 N	NA	NA	NO	BSL
	207-08-9	Benzo(k)fluoranthene	1.44E-08 J	5E-07	ug/m^3	IS28SS34-0001	20/70		5.0E-07	NA	8.6E-02 C	NA	NA	NO	BSL
	108-60-1	Bis(2-chloro-1-methylethyl) ether	7.58E-08 J	7.58E-08 J	ug/m^3	IS28SS36-0001	1/70		7.6E-08	NA	5.7E-03 C	NA	NA	NO	BSL
	85-68-7	Butylbenzylphthalate	3.41E-08 J	2.58E-07 J	ug/m^3	IS28SS01-0001	7/70		2.6E-07	NA	7.3E+01 N	NA	NA	NO	BSL
	105-60-2	Caprolactam	6.52E-08 J	6.52E-08 J	ug/m^3	IS28SS36-0001	1/70		6.5E-08	NA	1.8E+02 N	NA	NA	NO	BSL
	86-74-8	Carbazole	1.67E-08 J	1.06E-07 J	ug/m^3	IS28SS36-0001	5/70		1.1E-07	NA	3.1E-01 C	NA	NA	NO	BSL
	218-01-9	Chrysene	1.74E-08 J	4.7E-07	ug/m^3	IS28SS39-0001	28/70		4.7E-07	NA	8.6E-01 C	NA	NA	NO	BSL
	84-74-2	Di-n-butylphthalate	1.44E-08 J	4.85E-07	ug/m^3	IS28SB22-0103	19/70		4.8E-07	NA	3.7E+01 N	NA	NA	NO	BSL
	117-84-0	Di-n-octylphthalate	9.09E-08 J	9.09E-08 J	ug/m^3	IS28SS36-0001	1/70		9.1E-08	NA	7.3E+00 N	NA	NA	NO	BSL
	53-70-3	Dibenz(a,h)anthracene	2.2E-08 J	3.79E-07 J	ug/m^3	IS28SS42-0001	10/70		3.8E-07	NA	8.6E-04 C	NA	NA	NO	BSL
	132-64-9	Dibenzofuran	8.5E-05 J	4.6E-04 J	ug/m^3	IS28SS36-0001	4/70		4.6E-04	NA	7.3E-01 N	NA	NA	NO	BSL
	84-66-2	Diethylphthalate	1.74E-08 J	1.21E-07 J	ug/m^3	IS28SS19-0001	9/70		1.2E-07	NA	2.9E+02 N	NA	NA	NO	BSL
	131-11-3	Dimethyl phthalate	8.33E-08 J	8.33E-08 J	ug/m^3	IS28SS36-0001	1/70		8.3E-08	NA	3.7E+03 N	NA	NA	NO	BSL
	206-44-0	Fluoranthene	1.52E-08 J	6.44E-07	ug/m^3	IS28SS39-0001	32/70		6.4E-07	NA	1.5E+01 N	NA	NA	NO	BSL
	86-73-7	Fluorene	8.8E-05 J	1.8E-04 J	ug/m^3	IS28SS36-0001	3/70		1.8E-04	NA	1.5E+01 N	NA	NA	NO	BSL
	118-74-1	Hexachlorobenzene	9.85E-08 J	9.85E-08 J	ug/m^3	IS28SS36-0001	1/70		9.8E-08	NA	3.9E-03 C	NA	NA	NO	BSL
	87-68-3	Hexachlorobutadiene	9.09E-08 J	9.09E-08 J	ug/m^3	IS28SS36-0001	1/70		9.1E-08	NA	7.3E-02 N!	NA	NA	NO	BSL
	77-47-4	Hexachlorocyclopentadiene	6.0E-08 J	5.98E-08 J	ug/m^3	IS28SS36-0001	1/70		6.0E-08	NA	2.1E-02 N	NA	NA	NO	BSL
	67-72-1	Hexachloroethane	7.2E-08 J	7.2E-08 J	ug/m^3	IS28SS36-0001	1/70		7.2E-08	NA	3.7E-01 N!	NA	NA	NO	BSL
	193-39-5	Indeno(1,2,3-cd)pyrene	2.27E-08 J	8.33E-07	ug/m^3	IS28SS15-0001	22/70		8.3E-07	NA	8.6E-03 C	NA	NA	NO	BSL
	78-59-1	Isophorone	8.33E-08 J	8.33E-08 J	ug/m^3	IS28SS36-0001	1/70		8.3E-08	NA	6.6E+00 C	NA	NA	NO	BSL
	91-20-3	Naphthalene	3.5E-04 J	1.5E-03 J	ug/m^3	IS28SS36-0001	3/70		1.5E-03	NA	3.3E-01 N	NA	NA	NO	BSL
	98-95-3	Nitrobenzene	2.1E-03 L	2.1E-03 L	ug/m^3	IS28SS06-0001	1/70		2.1E-03	NA	2.2E-01 N	NA	NA	NO	BSL
	87-86-5	Pentachlorophenol	9.85E-08 J	9.85E-08 J	ug/m^3	IS28SS36-0001	1/70		9.8E-08	NA	5.2E-02 C	NA	NA	NO	BSL
	85-01-8	Phenanthrene	1.59E-08 J	5.61E-07	ug/m^3	IS28SS17-0001	22/70		5.6E-07	NA	1.1E+01 N	NA	NA	NO	BSL
	108-95-2	Phenol	7.58E-08 J	7.58E-08 J	ug/m^3	IS28SS36-0001	1/70		7.6E-08	NA	1.1E+02 N	NA	NA	NO	BSL
	129-00-0	Pyrene	4.1E-06 J	1.5E-04	ug/m^3	IS28SS34-0001	34/70		1.5E-04	NA	1.1E+01 N	NA	NA	NO	BSL
	111-91-1	bis(2-Chloroethoxy)methane	8.33E-08 J	8.33E-08 J	ug/m^3	IS28SS36-0001	1/70		8.3E-08	NA	1.8E-01 C	NA	NA	NO	BSL
	111-44-4	bis(2-Chloroethyl)ether	2.6E-03 J	2.6E-03 J	ug/m^3	IS28SS36-0001	1/70		2.6E-03	NA	5.7E-03 C	NA	NA	NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	2.5E-07 J	1.4E-06 J	ug/m^3	IS28SS01-0001	10/70		1.4E-06	NA	4.5E-01 C	NA	NA	NO	BSL
	621-64-7	n-Nitroso-di-n-propylamine	7.6E-08 J	7.6E-08 J	ug/m^3	IS28SS36-0001	1/70		7.6E-08	NA	8.9E-04 C	NA	NA	NO	BSL
	86-30-6	n-Nitrosodiphenylamine	1.7E-08 J	9.1E-06	ug/m^3	IS28SS19-0001	15/70		9.1E-06	NA	1.3E+00 C	NA	NA	NO	BSL

Table 2.7
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	99-35-4	1,3,5-Trinitrobenzene	1.8E-07	5.1E-07	ug/m^3	IS28SS11-0001P	3/70		5.1E-07	NA	1.1E+01 N	NA	NA	NO	BSL
	99-65-0	1,3-Dinitrobenzene	4.8E-08 J	4.8E-08 J	ug/m^3	IS28SB08-0103	1/70		4.8E-08	NA	3.7E-02 N	NA	NA	NO	BSL
	118-96-7	2,4,6-Trinitrotoluene	3.1E-08 J	3.4E-07 L	ug/m^3	IS28SS24-0001	12/70		3.4E-07	NA	1.8E-01 N	NA	NA	NO	BSL
	121-14-2	2,4-Dinitrotoluene	5.1E-08 J	1.7E-07	ug/m^3	IS28SS24-0001	5/70		1.7E-07	NA	7.3E-01 N	NA	NA	NO	BSL
	2691-41-0	HMX	1.7E-07	1.7E-07	ug/m^3	IS28SS37-0001	1/70		1.7E-07	NA	1.8E+01 N	NA	NA	NO	BSL
	98-95-3	Nitrobenzene	3.6E-08 L	2.0E-07 L	ug/m^3	IS28SB19-0105	17/70		2.0E-07	NA	2.2E-01 N	NA	NA	NO	BSL
	479-45-8	Tetryl	4.1E-08 J	4.7E-07	ug/m^3	IS28SS24-0001	4/70		4.7E-07	NA	3.7E+00 N	NA	NA	NO	BSL
	7429-90-5	Aluminum	7.9E-04	1.1E-02	ug/m^3	IS28SB06-0103	70/70		1.1E-02	NA	3.7E-01 N	NA	NA	NO	BSL
	7440-36-0	Antimony	5.1E-07 J	7.7E-05 L	ug/m^3	IS28SB19-0105	7/30		7.7E-05	NA	1.5E-01 N	NA	NA	NO	BSL
	7440-38-2	Arsenic	6.9E-07 J	2.9E-04 L	ug/m^3	IS28SS04-0001	68/70		2.9E-04	NA	4.1E-04 C	NA	NA	NO	BSL
	7440-39-3	Barium	9.7E-06 J	2.8E-03	ug/m^3	IS28SB19-0105	70/70		2.8E-03	NA	5.1E-02 N	NA	NA	NO	BSL
	7440-41-7	Beryllium	4.3E-07 J	1.5E-06 J	ug/m^3	IS28SS22-0001	7/70		1.5E-06	NA	7.5E-04 C	NA	NA	NO	BSL
	7440-43-9	Cadmium	2.4E-07 J	1.1E-04	ug/m^3	IS28SS19-0001	36/70		1.1E-04	NA	9.9E-04 C	NA	NA	NO	BSL
	7440-70-2	Calcium	3.7E-05 J	1.8E-02	ug/m^3	IS28SS10-0001	70/70		1.8E-02	NA	NA	NA	NA	NO	NUT
	7440-47-3	Chromium	1.2E-06 J	1.3E-04	ug/m^3	IS28SB19-0105	69/70		1.3E-04	NA	1.5E-04 C	NA	NA	NO	BSL
	7440-48-4	Cobalt	5.8E-07 J	1.5E-05 J	ug/m^3	IS28SB34-0103	65/70		1.5E-05	NA	6.4E-04 C	NA	NA	NO	BSL
	7440-50-8	Copper	1.7E-06 J	1.7E-03	ug/m^3	IS28SB19-0105	67/70		1.7E-03	NA	1.5E+01 N	NA	NA	NO	BSL
	7439-89-6	Iron	1.0E-03	9.8E-02	ug/m^3	IS28SB19-0105	70/70		9.8E-02	NA	1.1E+02 N	NA	NA	NO	BSL
	7439-92-1	Lead	2.7E-06	1.3E-02 J	ug/m^3	IS28SB19-0105	70/70		1.3E-02	NA	NA	NA	NA	NO	NTX
	7439-95-4	Magnesium	7.2E-05 J	1.8E-02	ug/m^3	IS28SB19-0105	70/70		1.8E-02	NA	NA	NA	NA	NO	NUT
	7439-96-5	Manganese	3.2E-06 K	8.0E-04 J	ug/m^3	IS28SB19-0105	70/70		8.0E-04	NA	5.2E-03 N	NA	NA	NO	BSL
	7439-97-6	Mercury	9.1E-08 K	8.7E-06	ug/m^3	IS28SS15-0001	20/70		8.7E-06	NA	3.1E-02 N	NA	NA	NO	BSL
	7440-02-0	Nickel	1.7E-06 J	1.9E-04	ug/m^3	IS28SB19-0105	48/70		1.9E-04	NA	7.3E+00 N	NA	NA	NO	BSL
	7440-09-7	Potassium	6.7E-05 J	4.7E-03	ug/m^3	IS28SB19-0105	60/70		4.7E-03	NA	NA	NA	NA	NO	NUT
	7782-49-2	Selenium	2.5E-07 J	9.8E-07 J	ug/m^3	IS28SS10-0001	13/70		9.8E-07	NA	1.8E+00 N	NA	NA	NO	BSL
	7440-22-4	Silver	6.3E-07 J	1.2E-05	ug/m^3	IS28SS10-0001	16/70		1.2E-05	NA	1.8E+00 N	NA	NA	NO	BSL
	7440-23-5	Sodium	4.7E-05 J	1.2E-04 J	ug/m^3	IS28SB12-0103	8/70		1.2E-04	NA	NA	NA	NA	NO	NUT
	7440-28-0	Thallium	6.6E-07 J	6.6E-07 J	ug/m^3	IS28SB22-0103	1/70		6.6E-07	NA	2.6E-02 N	NA	NA	NO	BSL
	7440-62-2	Vanadium	2.3E-06 J	7.0E-05 J	ug/m^3	IS28SB12-0103	70/70		7.0E-05	NA	1.1E-01 N	NA	NA	NO	BSL
	7440-66-6	Zinc	5.6E-06 K	5.4E-02 L	ug/m^3	IS28SS08-0001	70/70		5.4E-02	NA	1.1E+02 N	NA	NA	NO	BSL

* Surface soil & subsurface soil combined

[1] Minimum/Maximum calculated air concentrations from soil concentrations. Air concentrations calculated as Cair = Csoil*1000*(1/PEF+1/VF)
VF only included in calculation for VOCs. VF calculated on Table 2.2A. PEF = 1.32E+09 m3/kg.

[2] Maximum concentration is used for screening.

[3] Background values not available.

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered

Table 2.7

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection

[4] Risk-Based Concentration Table, October 15, 2003, U.S. EPA Region III, Jennifer Hubbard. Ambient Air RBC.

RBC value for pyrene used as surrogate for phenanthrene and benzo(g,h,i)perylene.

RBC value for 2-chlorophenol used as surrogate for 2-nitrophenol and 4-chloro-3-methylphenol.

RBC value for methoxychlor used as surrogate for 4-bromophenyl-phenylether, and 4-chlorophenyl-phenylether.

RBC value for bis(2-chloroethyl)ether used as surrogate for bis(2-chloro-1-methylethyl) ether.

RBC value for bis(2-chloro) isoprpyl ehter used as surrogate for bis(2-chloroethoxy) methane.

RBC value for naphthalene used as surrogate for acenaphthylene.

RBC value for chromium VI used for total chromium.

RBC value for manganese-nonfood used as surrogate for manganese.

RBC value for mercuric chloride used as surrogate for mercury.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic

Table 2.8
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Tap Water	108-88-3	Toluene	2.0E+00 J	2.0E+00 J	UG/L	IS28MW020903	1/4	10 - 10	2.0E+00	7.0E+00	7.5E+01 N	1	PMCL	NO	BSL
	106-44-5	4-Methylphenol	6.0E-01 J	6.0E-01 J	UG/L	IS28MW020903	1/4	10 - 10	6.0E-01	NA	1.8E+01 N	NA	NA	NO	BSL
	105-60-2	Caprolactam	3.0E+00 J	9.0E+00	UG/L	IS28MW020903	2/4	10 - 10	9.0E+00	NA	1.8E+03 N	NA	NA	NO	BSL
	117-81-7	bis(2-Ethylhexyl)phthalate	2.5E+02 J	2.5E+02 J	UG/L	IS28MW010903	1/4	10 - 10	2.5E+02	NA	4.8E+00 C	NA	NA	YES	ASL
	7429-90-5	Aluminum	5.5E+02 J	1.9E+04 J	UG/L	IS28MW030903	4/4	200 - 200	1.9E+04	2.9E+08	3.7E+03 N	50 - 200	SMCL	YES	ASL
	7440-36-0	Antimony	2.1E+00 J	2.1E+00 J	UG/L	IS28MW020903	1/4	60 - 60	2.1E+00	NA	1.5E+00 N	6	PMCL	YES	ASL
	7440-38-2	Arsenic	1.2E+01 J	3.4E+02 J	UG/L	IS28MW010903	3/4	10 - 10	3.4E+02	NA	4.5E-02 C	10	PMCL	YES	ASL
	7440-39-3	Barium	3.2E+01 J	2.4E+02 J	UG/L	IS28MW030903	4/4	200 - 200	2.4E+02	2.5E+02	2.6E+02 N	2,000	PMCL	NO	BSL
	7440-41-7	Beryllium	4.0E-01 J	2.4E+00 J	UG/L	IS28MW030903	3/4	5 - 5	2.4E+00	NA	7.3E+00 N	4	PMCL	NO	BSL
	7440-43-9	Cadmium	3.3E+00 J	3.3E+00 J	UG/L	IS28MW030903	1/4	5 - 5	3.3E+00	2.8E+00	1.8E+00 N	5	PMCL	YES	ASL
	7440-70-2	Calcium	3.1E+03 J	1.1E+04 J	UG/L	IS28MW030903	4/4	5000 - 5000	1.1E+04	6.0E+05	NA	NA	NA	NO	NUT
	7440-47-3	Chromium	2.2E+00 J	2.7E+01 J	UG/L	IS28MW030903	4/4	10 - 10	2.7E+01	2.1E+01	1.1E+01 N	100	PMCL	YES	ASL
	7440-48-4	Cobalt	7.2E+00 J	6.0E+01 J	UG/L	IS28MW030903	3/4	50 - 50	6.0E+01	4.0E+01	7.3E+01 N	NA	NA	NO	BSL
	7440-50-8	Copper	1.7E+01 J	5.1E+01 J	UG/L	IS28MW030903	4/4	25 - 25	5.1E+01	2.2E+01	1.5E+02 N	1,000	SMCL	NO	BSL
	7439-89-6	Iron	4.8E+03 J	3.6E+04 J	UG/L	IS28MW030903	4/4	100 - 100	3.6E+04	5.7E+04	1.1E+03 N	300	SMCL	YES	ASL
	7439-92-1	Lead	4.8E+00 J	3.0E+01 J	UG/L	IS28MW030903	4/4	3 - 3	1.4E+01	NA	1.5E+01	NA	NA	NO	BSL
	7439-95-4	Magnesium	2.3E+03 J	9.7E+03 J	UG/L	IS28MW030903	4/4	5000 - 5000	9.7E+03	3.1E+04	NA	NA	NA	NO	NUT
	7439-96-5	Manganese	1.4E+02 J	6.0E+02 J	UG/L	IS28MW030903	4/4	15 - 15	6.0E+02	2.8E+04	5.1E+02 N	50	SMCL	YES	ASL
	7440-02-0	Nickel	7.4E+00 J	1.3E+01 J	UG/L	IS28MW040903	3/4	40 - 40	1.3E+01	3.9E+01	7.3E+01 N	NA	NA	NO	BSL
	7440-09-7	Potassium	3.0E+03 J	6.3E+03 J	UG/L	IS28MW030903	3/4	5000 - 5000	6.3E+03	8.3E+04	NA	NA	NA	NO	NUT
	7440-23-5	Sodium	1.2E+04 J	2.5E+04 J	UG/L	IS28MW030903	4/4	5000 - 5000	2.5E+04	8.0E+04	NA	NA	NA	NO	NUT
	7440-62-2	Vanadium	1.5E+01 J	6.2E+01 J	UG/L	IS28MW030903	3/4	50 - 50	6.2E+01	2.4E+01	1.1E+00 N	NA	NA	YES	ASL
	7440-66-6	Zinc	1.0E+02 J	1.6E+03 J	UG/L	IS28MW030903	4/4	20 - 20	1.6E+03	4.5E+01	1.1E+03 N	5,000	SMCL	YES	ASL
Water in Excavation Pit	7429-90-5	Aluminum	2.5E+02	8.2E+03	UG/L	IS28MW030903	4/4	200 - 200	8.2E+03	2.9E+08	3.7E+03 N	50 - 200	SMCL	YES	ASL
	7440-36-0	Antimony	3.1E+00 J	3.1E+00 J	UG/L	IS28MW020903	1/4	60 - 60	3.1E+00	NA	1.5E+00 N	6	PMCL	YES	ASL
	7440-38-2	Arsenic	4.2E+00 J	3.2E+02	UG/L	IS28MW010903	3/4	10 - 10	3.2E+02	NA	4.5E-02 C	10	PMCL	YES	ASL
	7440-39-3	Barium	3.2E+01 J	1.8E+02 J	UG/L	IS28MW030903	4/4	200 - 200	1.8E+02	2.5E+02	2.6E+02 N	2000	PMCL	NO	BSL
	7440-41-7	Beryllium	3.3E-01 J	3.3E-01 J	UG/L	IS28MW020903 IS28MW040903	2/4	5 - 5	3.3E-01	NA	7.3E+00 N	4	PMCL	NO	BSL
	7440-43-9	Cadmium	8.0E+00 K	1.0E+01 K	UG/L	IS28MW020903	2/4	5 - 5	1.0E+01	2.8E+00	1.8E+00 N	5	PMCL	YES	ASL
	7440-70-2	Calcium	2.7E+03 J	9.3E+03	UG/L	IS28MW030903	4/4	5000 - 5000	9.3E+03	6.0E+05	NA	NA	NA	NO	NUT
	7440-47-3	Chromium	1.5E+00 J	1.2E+01 K	UG/L	IS28MW030903	4/4	10 - 10	1.2E+01	2.1E+01	1.1E+01 N	100	PMCL	YES	ASL
	7440-48-4	Cobalt	6.6E+00 J	4.1E+01 J	UG/L	IS28MW030903	3/4	50 - 50	4.1E+01	4.0E+01	7.3E+01 N	NA	NA	NO	BSL
	7440-50-8	Copper	1.0E+01 J	3.1E+01 K	UG/L	IS28MW030903	4/4	25 - 25	3.1E+01	2.2E+01	1.5E+02 N	1000	SMCL	NO	BSL
	7439-89-6	Iron	9.8E+02	1.5E+04	UG/L	IS28MW030903	4/4	100 - 100	1.5E+04	5.7E+04	1.1E+03 N	300	SMCL	YES	ASL
	7439-92-1	Lead	2.2E+00 J	1.3E+01	UG/L	IS28MW030903	3/4	3 - 3	5.8E+00	NA	1.5E+01	NA	NA	NO	BSL
	7439-95-4	Magnesium	1.9E+03 J	8.6E+03	UG/L	IS28MW020903	4/4	5000 - 5000	8.6E+03	3.1E+04	NA	NA	NA	NO	NUT

Table 2.8

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
	7439-96-5	Manganese	1.3E+02	4.4E+02	UG/L	IS28MW010903	4/4	15 - 15	4.4E+02	2.8E+04	5.1E+02 N	50	SMCL	NO	BSL
	7440-02-0	Nickel	5.1E+00 J	8.5E+00 J	UG/L	IS28MW040903	3/4	40 - 40	8.5E+00	3.9E+01	7.3E+01 N	NA	NA	NO	BSL
	7440-09-7	Potassium	4.8E+03 J	5.4E+03	UG/L	IS28MW030903	2/4	5000 - 5000	5.4E+03	8.3E+04	NA	NA	NA	NO	NUT
	7440-23-5	Sodium	1.2E+04	2.6E+04	UG/L	IS28MW030903	4/4	5000 - 5000	2.6E+04	8.0E+04	NA	NA	NA	NO	NUT
	7440-62-2	Vanadium	1.1E+01 J	2.4E+01 J	UG/L	IS28MW030903	2/4	50 - 50	2.4E+01	2.4E+01	1.1E+00 N	NA	NA	YES	ASL
	7440-66-6	Zinc	7.5E+01	1.2E+03	UG/L	IS28MW030903	4/4	20 - 20	1.2E+03	4.5E+01	1.1E+03 N	5000	SMCL	YES	ASL

Following USEPA Region III guidance, dissolved inorganic groundwater data used for tap water because an order of magnitude difference noted between dissolved and total results.

Total inorganic groundwater data used for water in excavation pit because construction worker would be exposed to the water in the excavation pit that has not been filtered.

[1] Minimum/Maximum detected concentrations.

[2] Maximum concentration is used for screening, except for lead where used average value.

[3] Background values are 95% UTL from Background Investigation Report.

[4] Risk-Based Concentration Table, April 25, 2003, U.S. EPA Region III, Jennifer Hubbard. Tap Water RBC.
RBC value for Chromium VI used for total chromium.
The groundwater action level for lead of 15 ug/l used as the screening value for the COPC selection.
RBC value for manganese-nonfood used as surrogate for manganese.

[5] Rationale Codes

Selection Reason: Above Screening Levels (ASL)

Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
PMCL = Primary Maximum Contaminant Level
SMCL = Secondary Maximum Contaminant Level

Table 2.9
OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Point	CAS Number	Chemical	Minimum [1] Concentration Qualifier	Maximum [1] Concentration Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration [2] Used for Screening	Background [3] Value	Screening [4] Toxicity Value	Potential ARAR/TBC Value	Potential ARAR/TBC Source [6]	COPC Flag	Rationale for [5] Contaminant Deletion or Selection
Water Vapors at Showerhead	108-88-3	Toluene	2.0E+00 J	2.0E+00 J	UG/L	IS28MW020903	1/4	10 - 10	2.0E+00	7.0E+00	7.5E+01 N	1	PMCL	NO	BSL

Minimum/Maximum detected concentrations.

[1] Maximum concentration is used for screening.

[2] Background values are 95% UTL from Background Investigation Report.

[3] Risk-Based Concentration Table, April 25, 2003, U.S. EPA Region III, Jennifer Hubbard. Tap Water RBC.

[4] Rationale Codes

[5] Selection Reason: Above Screening Levels (ASL)
Deletion Reason: No Toxicity Information (NTX)
Essential Nutrient (NUT)
Below Screening Level (BSL)

[6] Primary MCLs obtained from 40 CFR Chapter 1 (7-1-99 Edition), Part 141, Subpart G

SQL = Sample Quantification Limit
COPC = Chemical of Potential Concern
ARAR/TBC = Applicable or Relevant and Appropriate Requirement/ To Be Considered
J = Estimated Value
K = Biased High
L = Biased Low
C = Carcinogenic
N = Noncarcinogenic
PMCL = Primary Maximum Contaminant Level
SMCL = Secondary Maximum Contaminant Level

Table 3.1.RME
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Remedial Investigation Report Site 28
IHDIV-NSWC

Scenario Timeframe: Current
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	UCL (Distribution)	Maximum Concentration (Qualifier)		Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Site 28 Soil*										
	Benzo(a)pyrene	MG/KG	2.1E-01	2.9E-01 (NP)	8.1E-01		2.9E-01	MG/KG	95% Cheb-m	(3)
	Benzo(b)fluoranthene	MG/KG	2.3E-01	3.5E-01 (NP)	1.7E+00		3.5E-01	MG/KG	95% Cheb-m	(3)
	Dibenz(a,h)anthracene	MG/KG	2.3E-01	3.0E-01 (NP)	5.0E-01	J	3.0E-01	MG/KG	95% Cheb-m	(3)
	Indeno(1,2,3-cd)pyrene	MG/KG	2.2E-01	3.2E-01 (NP)	1.1E+00		3.2E-01	MG/KG	95% Cheb-m	(3)
	n-Nitroso-di-n-propylamine	MG/KG	2.5E-01	3.3E-01 (NP)	1.0E-01	J	1.0E-01	MG/KG	Max	(5)
	Aluminum	MG/KG	5.7E+03	6.6E+03 (T)	1.5E+04		6.6E+03	MG/KG	95% UCL-T	(4)
	Antimony	MG/KG	4.5E+00	2.6E+01 (NP)	1.0E+02	L	2.6E+01	MG/KG	97.5% Cheb-m	(3)
	Arsenic	MG/KG	5.0E+01	1.2E+02 (T)	3.8E+02	L	1.2E+02	MG/KG	95% UCL-T	(1)
	Barium	MG/KG	1.5E+02	4.0E+02 (NP)	3.7E+03		4.0E+02	MG/KG	95% Cheb-m	(3)
	Cadmium	MG/KG	1.2E+01	4.4E+01 (NP)	1.4E+02		4.4E+01	MG/KG	99% Cheb-m	(3)
	Chromium	MG/KG	1.7E+01	3.2E+01 (NP)	1.8E+02		3.2E+01	MG/KG	95% Cheb-m	(3)
	Copper	MG/KG	1.0E+02	3.4E+02 (NP)	2.3E+03		3.4E+02	MG/KG	97.5% Cheb-m	(3)
	Iron	MG/KG	1.7E+04	2.2E+04 (T)	1.3E+05		2.2E+04	MG/KG	95% UCL-T	(1)
	Manganese	MG/KG	1.4E+02	2.3E+02 (T)	1.1E+03	J	2.3E+02	MG/KG	95% UCL-T	(1)
	Mercury	MG/KG	3.0E-01	1.3E+00 (NP)	1.2E+01		1.3E+00	MG/KG	97.5% Cheb-m	(3)
	Nickel	MG/KG	1.2E+01	1.4E+01 (T)	2.5E+02		1.4E+01	MG/KG	95% UCL-T	(1)
	Thallium	MG/KG	3.9E-01	4.7E-01 (NP)	8.7E-01	J	4.7E-01	MG/KG	95% Cheb-m	(3)
	Vanadium	MG/KG	2.3E+01	2.7E+01 (T)	9.3E+01	J	2.7E+01	MG/KG	95% UCL-T	(1)
	Zinc	MG/KG	6.8E+03	2.4E+04 (NP)	7.2E+04	L	2.4E+04	MG/KG	99% Cheb-m	(3)

Table 3.1.RME
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Remedial Investigation Report Site 28
IHDIV-NSWC

Scenario Timeframe: Current
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale

* Surface soil & subsurface soil combined.

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

ProUCL, Version 2.1 used to determine distribution of data using the Shapiro-Wilk W Test. ProUCL used to calculate RME EPC, following recommendations based on distribution and standard deviation in users guide (USEPA. February 2003. ProUCL, Version 2.1. Prepared by Lockheed Martin Environmental Services).

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of data (Mean-N); Mean of Log-transformed Data (Mean-T).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) Shapiro-Wilk W Test indicates data are normally distributed.

(3) Shapiro-Wilk W Test indicates data neither log-normally or normally distributed. Use non-parametric RME EPC.

(4) Shapiro-Wilk W Test indicates data fit both log-normal and normal distribution. Select distribution with higher W Test result.

(5) UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

N = Normal
T = Log-Transformed
NP = Non-Parametric

J = Estimated Value

Table 3.2.RME
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Remedial Investigation Report Site 28
IHDIV-NSWC

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	UCL (Distribution)	Maximum Concentration (Qualifier)		Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Surface Soil										
	Benzo(a)pyrene	MG/KG	2.1E-01	3.7E-01 (NP)	8.1E-01		3.7E-01	MG/KG	95% Cheb-m	(3)
	Benzo(b)fluoranthene	MG/KG	2.4E-01	4.7E-01 (NP)	1.7E+00		4.7E-01	MG/KG	95% Cheb-m	(3)
	Dibenz(a,h)anthracene	MG/KG	2.4E-01	3.9E-01 (NP)	5.0E-01	J	3.9E-01	MG/KG	95% Cheb-m	(3)
	Indeno(1,2,3-cd)pyrene	MG/KG	2.3E-01	4.1E-01 (NP)	1.1E+00		4.1E-01	MG/KG	95% Cheb-m	(3)
	n-Nitroso-di-n-propylamine	MG/KG	2.8E-01	4.4E-01 (NP)	1.0E-01	J	4.4E-01	MG/KG	95% Cheb-m	(3)
	Aluminum	MG/KG	5.8E+03	6.5E+03 (N)	1.3E+04		6.5E+03	MG/KG	95% UCL-N	(4)
	Antimony	MG/KG	1.7E+00	7.7E+00 (NP)	1.8E+01	L	7.7E+00	MG/KG	97.5% Cheb-m	(3)
	Arsenic	MG/KG	7.8E+01	1.5E+02 (T)	3.8E+02	L	1.5E+02	MG/KG	95% UCL-T	(1)
	Barium	MG/KG	1.5E+02	4.7E+02 (NP)	1.6E+03		4.7E+02	MG/KG	97.5% Cheb-m	(3)
	Cadmium	MG/KG	1.6E+01	6.1E+01 (T)	1.4E+02		6.1E+01	MG/KG	95% Cheb	(1)
	Chromium	MG/KG	1.9E+01	4.2E+01 (NP)	1.7E+02		4.2E+01	MG/KG	95% Cheb-m	(3)
	Copper	MG/KG	1.2E+02	3.9E+02 (NP)	1.3E+03		3.9E+02	MG/KG	95% Cheb-m	(3)
	Iron	MG/KG	1.9E+04	2.5E+04 (T)	8.5E+04		2.5E+04	MG/KG	95% UCL-T	(1)
	Manganese	MG/KG	2.1E+02	3.4E+02 (T)	7.1E+02	J	3.4E+02	MG/KG	95% UCL-T	(1)
	Mercury	MG/KG	5.5E-01	2.6E+00 (NP)	1.2E+01		2.6E+00	MG/KG	95% Cheb-m	(3)
	Vanadium	MG/KG	2.4E+01	3.4E+01 (NP)	7.0E+01		3.4E+01	MG/KG	95% Cheb-m	(3)
	Zinc	MG/KG	9.6E+03	4.0E+04 (NP)	7.2E+04	L	4.0E+04	MG/KG	99% Cheb-m	(3)

Table 3.2.RME
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Remedial Investigation Report Site 28
IHDIV-NSWC

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

ProUCL, Version 2.1 used to determine distribution of data using the Shapiro-Wilk W Test. ProUCL used to calculate RME EPC, following recommendations based on distribution and standard deviation in users guide (USEPA. February 2003. ProUCL, Version 2.1. Prepared by Lockheed Martin Environmental Services).

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of data (Mean-N); Mean of Log-transformed Data (Mean-T).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) Shapiro-Wilk W Test indicates data are normally distributed.

(3) Shapiro-Wilk W Test indicates data neither log-normally or normally distributed. Use non-parametric RME EPC.

(4) Shapiro-Wilk W Test indicates data fit both log-normal and normal distribution. Select distribution with higher W Test result.

(5) Mean exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

(6) Maximum detected concentration used because sample size is less than 5.

N = Normal

T = Log-Transformed

NP = Non-Parametric

J = Estimated Value

Table 3.3.RME
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Remedial Investigation Report Site 28
IHDIV-NSWC

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Mattawoman Creek	Arsenic	UG/L	2.7E+00	NA	3.8E+00 J	3.8E+00	UG/L	Max	(6)
	Lead	UG/L	2.2E+01	NA	6.2E+01	6.2E+01	UG/L	Max	(6)

Full statistics for data included in Appendix.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
ProUCL, Version 2.1 used to determine distribution of data using the Shapiro-Wilk W Test. ProUCL used to calculate RME EPC, following recommendations based on distribution and standard deviation in users guide (USEPA. February 2003. ProUCL, Version 2.1. Prepared by Lockheed Martin Environmental Services).
Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of data (Mean-N); Mean of Log-transformed Data (Mean-T).
(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Shapiro-Wilk W Test indicates data neither log-normally or normally distributed. Use non-parametric RME EPC.
(4) Shapiro-Wilk W Test indicates data fit both log-normal and normal distribution. Select distribution with higher W Test result.
(5) 95% UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(6) Maximum detected concentration used because sample size is less than 5.

N = Normal
T = Log-Transformed
NP = Non-Parametric
J = Estimated Value

Table 3.4.RME
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Remedial Investigation Report Site 28
IHDIV-NSWC

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	UCL (Distribution)	Maximum Concentration (Qualifier)		Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Site 28 Soil*										
	Benzo(a)pyrene	MG/KG	2.1E-01	2.9E-01 (NP)	8.1E-01		2.9E-01	MG/KG	95% Cheb-m	(3)
	Benzo(b)fluoranthene	MG/KG	2.3E-01	3.5E-01 (NP)	1.7E+00		3.5E-01	MG/KG	95% Cheb-m	(3)
	Dibenz(a,h)anthracene	MG/KG	2.3E-01	3.0E-01 (NP)	5.0E-01	J	3.0E-01	MG/KG	95% Cheb-m	(3)
	Indeno(1,2,3-cd)pyrene	MG/KG	2.2E-01	3.2E-01 (NP)	1.1E+00		3.2E-01	MG/KG	95% Cheb-m	(3)
	n-Nitroso-di-n-propylamine	MG/KG	2.5E-01	3.3E-01 (NP)	1.0E-01	J	1.0E-01	MG/KG	Max	(5)
	Aluminum	MG/KG	5.7E+03	6.6E+03 (T)	1.5E+04		6.6E+03	MG/KG	95% UCL-T	(4)
	Antimony	MG/KG	4.5E+00	2.6E+01 (NP)	1.0E+02	L	2.6E+01	MG/KG	97.5% Cheb-m	(3)
	Arsenic	MG/KG	5.0E+01	1.2E+02 (T)	3.8E+02	L	1.2E+02	MG/KG	95% UCL-T	(1)
	Barium	MG/KG	1.5E+02	4.0E+02 (NP)	3.7E+03		4.0E+02	MG/KG	95% Cheb-m	(3)
	Cadmium	MG/KG	1.2E+01	4.4E+01 (NP)	1.4E+02		4.4E+01	MG/KG	99% Cheb-m	(3)
	Chromium	MG/KG	1.7E+01	3.2E+01 (NP)	1.8E+02		3.2E+01	MG/KG	95% Cheb-m	(3)
	Copper	MG/KG	1.0E+02	3.4E+02 (NP)	2.3E+03		3.4E+02	MG/KG	97.5% Cheb-m	(3)
	Iron	MG/KG	1.7E+04	2.2E+04 (T)	1.3E+05		2.2E+04	MG/KG	95% UCL-T	(1)
	Lead	MG/KG	7.1E+02	3.5E+03 (NP)	1.7E+04	J	7.1E+02	MG/KG	Mean-N	(3)
	Manganese	MG/KG	1.4E+02	2.3E+02 (T)	1.1E+03	J	2.3E+02	MG/KG	95% UCL-T	(1)
	Mercury	MG/KG	3.0E-01	1.3E+00 (NP)	1.2E+01		1.3E+00	MG/KG	97.5% Cheb-m	(1)
	Nickel	MG/KG	1.2E+01	1.4E+01 (T)	2.5E+02		1.4E+01	MG/KG	95% UCL-T	(1)
	Thallium	MG/KG	3.9E-01	4.7E-01 (NP)	8.7E-01	J	4.7E-01	MG/KG	95% Cheb-m	(3)
	Vanadium	MG/KG	2.3E+01	2.7E+01 (T)	9.3E+01	J	2.7E+01	MG/KG	95% UCL-T	(1)
	Zinc	MG/KG	6.8E+03	2.4E+04 (NP)	7.2E+04	L	2.4E+04	MG/KG	99% Cheb-m	(3)

* Surface soil & subsurface soil combined.

Table 3.4.RME
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Remedial Investigation Report Site 28
IHDIV-NSWC

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale

Full statistics for data included in Appendix.

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

ProUCL, Version 2.1 used to determine distribution of data using the Shapiro-Wilk W Test. ProUCL used to calculate RME EPC, following recommendations based on distribution and standard deviation in users guide (USEPA. February 2003. ProUCL, Version 2.1. Prepared by Lockheed Martin Environmental Services).

Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of data (Mean-N); Mean of Log-transformed Data (Mean-T).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.

(2) Shapiro-Wilk W Test indicates data are normally distributed.

(3) Shapiro-Wilk W Test indicates data neither log-normally or normally distributed. Use non-parametric RME EPC.

(4) Shapiro-Wilk W Test indicates data fit both log-normal and normal distribution. Select distribution with higher W Test result.

(5) UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

N = Normal
T = Log-Transformed
NP = Non-Parametric

J = Estimated Value

Table 3.5.RME
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Remedial Investigation Report Site 28
IHDIV-NSWC

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of (N/T)	Maximum Concentration (Qualifier)		Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Tap Water	bis(2-Ethylhexyl)phthalate	UG/L	6.4E+01	2.1E+02	2.5E+02	J	2.5E+02	UG/L	Max	(6)
	Aluminum	UG/L	8.2E+03	1.8E+04	1.9E+04	J	1.9E+04	UG/L	Max	(6)
	Antimony	UG/L	1.2E+00	1.9E+00	2.1E+00	J	2.1E+00	UG/L	Max	(6)
	Arsenic	UG/L	1.2E+02	3.1E+02	3.4E+02	J	3.4E+02	UG/L	Max	(6)
	Cadmium	UG/L	1.0E+00	2.8E+00	3.3E+00	J	3.3E+00	UG/L	Max	(6)
	Chromium	UG/L	1.4E+01	2.6E+01	2.7E+01	J	2.7E+01	UG/L	Max	(6)
	Iron	UG/L	1.5E+04	3.2E+04	3.6E+04	J	3.6E+04	UG/L	Max	(6)
	Manganese	UG/L	3.6E+02	6.0E+02	6.0E+02	J	6.0E+02	UG/L	Max	(6)
	Vanadium	UG/L	2.4E+01	5.5E+01	6.2E+01	J	6.2E+01	UG/L	Max	(6)
	Zinc	UG/L	8.1E+02	1.6E+03	1.6E+03	J	1.6E+03	UG/L	Max	(6)
Water in Excavation Pit	Aluminum	UG/L	8.2E+03	1.8E+04	8.2E+03		8.2E+03	UG/L	Max	(6)
	Antimony	UG/L	1.2E+00	1.9E+00	3.1E+00	J	3.1E+00	UG/L	Max	(6)
	Arsenic	UG/L	1.2E+02	3.1E+02	3.2E+02		3.2E+02	UG/L	Max	(6)
	Cadmium	UG/L	1.0E+00	2.8E+00	1.0E+01	K	1.0E+01	UG/L	Max	(6)
	Chromium	UG/L	1.4E+01	2.6E+01	1.2E+01	K	1.2E+01	UG/L	Max	(6)
	Iron	UG/L	1.5E+04	3.2E+04	1.5E+04		1.5E+04	UG/L	Max	(6)
	Vanadium	UG/L	2.4E+01	5.5E+01	2.4E+01	J	2.4E+01	UG/L	Max	(6)
	Zinc	UG/L	8.1E+02	1.6E+03	1.2E+03		1.2E+03	UG/L	Max	(6)

Full statistics for data included in Appendix.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
ProUCL, Version 2.1 used to determine distribution of data using the Shapiro-Wilk W Test. ProUCL used to calculate RME EPC, following recommendations based on distribution and standard deviation in users guide (USEPA. February 2003. ProUCL, Version 2.1. Prepared by Lockheed Martin Environmental Services).
Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T);

Table 3.5.RME
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Remedial Investigation Report Site 28
IHDIV-NSWC

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of (N/T)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale

95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of data (Mean-N); Mean of Log-transformed Data (Mean-T).

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Shapiro-Wilk W Test indicates data neither log-normally or normally distributed. Use non-parametric RME EPC.
(4) Shapiro-Wilk W Test indicates data fit both log-normal and normal distribution. Select distribution with higher W Test result.
(5) 95% UCL exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(6) Maximum detected concentration used because sample size is less than 5.

N = Normal
T = Log-Transformed
NP = Non-Parametric
J = Estimated Value

Table 3.1.CTE
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Remedial Investigation Report Site 28
IHDIV-NSWC

Scenario Timeframe: Current
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	UCL (Distribution)	Maximum Concentration (Qualifier)		Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Site 28 Soil*										
	Benzo(a)pyrene	MG/KG	2.1E-01	2.9E-01 (NP)	8.1E-01		1.7E-01	MG/KG	Mean-T	(3)
	Benzo(b)fluoranthene	MG/KG	2.3E-01	3.5E-01 (NP)	1.7E+00		1.7E-01	MG/KG	Mean-T	(3)
	Dibenz(a,h)anthracene	MG/KG	2.3E-01	3.0E-01 (NP)	5.0E-01	J	2.3E-01	MG/KG	Mean-N	(3)
	Indeno(1,2,3-cd)pyrene	MG/KG	2.2E-01	3.2E-01 (NP)	1.1E+00		1.7E-01	MG/KG	Mean-T	(3)
	n-Nitroso-di-n-propylamine	MG/KG	2.5E-01	3.3E-01 (NP)	1.0E-01	J	1.0E-01	MG/KG	Max	(5)
	Aluminum	MG/KG	5.7E+03	6.6E+03 (T)	1.5E+04		5.0E+03	MG/KG	Mean-T	(4)
	Antimony	MG/KG	4.5E+00	2.6E+01 (NP)	1.0E+02	L	4.1E-01	MG/KG	97.5% Cheb-m	(3)
	Arsenic	MG/KG	5.0E+01	1.2E+02 (T)	3.8E+02	L	1.5E+01	MG/KG	Mean-T	(1)
	Barium	MG/KG	1.5E+02	4.0E+02 (NP)	3.7E+03		4.9E+01	MG/KG	Mean-T	(3)
	Cadmium	MG/KG	1.2E+01	4.4E+01 (NP)	1.4E+02		1.6E+00	MG/KG	Mean-T	(3)
	Chromium	MG/KG	1.7E+01	3.2E+01 (NP)	1.8E+02		9.7E+00	MG/KG	Mean-T	(3)
	Copper	MG/KG	1.0E+02	3.4E+02 (NP)	2.3E+03		1.9E+01	MG/KG	Mean-T	(3)
	Iron	MG/KG	1.7E+04	2.2E+04 (T)	1.3E+05		1.1E+04	MG/KG	Mean-T	(1)
	Manganese	MG/KG	1.4E+02	2.3E+02 (T)	1.1E+03	J	6.8E+01	MG/KG	Mean-T	(1)
	Mercury	MG/KG	3.0E-01	1.3E+00 (NP)	1.2E+01		6.0E-02	MG/KG	Mean-T	(3)
	Nickel	MG/KG	1.2E+01	1.4E+01 (T)	2.5E+02		5.4E+00	MG/KG	Mean-T	(1)
	Thallium	MG/KG	3.9E-01	4.7E-01 (NP)	8.7E-01	J	3.6E-01	MG/KG	Mean-T	(3)
	Vanadium	MG/KG	2.3E+01	2.7E+01 (T)	9.3E+01	J	1.9E+01	MG/KG	Mean-T	(1)
	Zinc	MG/KG	6.8E+03	2.4E+04 (NP)	7.2E+04	L	4.9E+02	MG/KG	Mean-T	(3)

* Surface soil & subsurface soil combined.
Full statistics for data included in Appendix.

Table 3.1.CTE
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Remedial Investigation Report Site 28
IHDIV-NSWC

Scenario Timeframe: Current
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
ProUCL, Version 2.1 used to determine distribution of data using the Shapiro-Wilk W Test. ProUCL used to calculate RME EPC, following recommendations based on distribution and standard deviation in users guide (USEPA. February 2003. ProUCL, Version 2.1. Prepared by Lockheed Martin Environmental Services).
Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of data (Mean-N); Mean of Log-transformed Data (Mean-T).
(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Shapiro-Wilk W Test indicates data neither log-normally or normally distributed. Use distribution data most closely fit.
(4) Shapiro-Wilk W Test indicates data fit both log-normal and normal distribution. Select distribution with higher W Test result.
(5) Mean exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

N = Normal
T = Log-Transformed
NP = Non-Parametric
J = Estimated Value

Table 3.2.CTE
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Remedial Investigation Report Site 28
IHDIV-NSWC

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	UCL (Distribution)	Maximum Concentration (Qualifier)		Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Site 28 Surface Soil										
	Benzo(a)pyrene	MG/KG	2.1E-01	3.7E-01 (NP)	8.1E-01		1.5E-01	MG/KG	Mean-T	(3)
	Benzo(b)fluoranthene	MG/KG	2.4E-01	4.7E-01 (NP)	1.7E+00		1.5E-01	MG/KG	Mean-T	(3)
	Dibenz(a,h)anthracene	MG/KG	2.4E-01	3.9E-01 (NP)	5.0E-01	J	1.9E-01	MG/KG	Mean-T	(3)
	Indeno(1,2,3-cd)pyrene	MG/KG	2.3E-01	4.1E-01 (NP)	1.1E+00		1.5E-01	MG/KG	Mean-T	(3)
	n-Nitroso-di-n-propylamine	MG/KG	2.8E-01	4.4E-01 (NP)	1.0E-01	J	2.5E-01	MG/KG	Mean-T	(3)
	Aluminum	MG/KG	5.8E+03	6.5E+03 (N)	1.3E+04		5.8E+03	MG/KG	Mean-N	(4)
	Antimony	MG/KG	1.7E+00	5.9E+00 (NP)	1.8E+01	L	5.3E-01	MG/KG	Mean-T	(3)
	Arsenic	MG/KG	7.8E+01	1.5E+02 (T)	3.8E+02	L	3.9E+01	MG/KG	Mean-T	(1)
	Barium	MG/KG	1.5E+02	3.7E+02 (NP)	1.6E+03		6.8E+01	MG/KG	Mean-T	(3)
	Cadmium	MG/KG	1.6E+01	6.1E+01 (T)	1.4E+02		3.3E+00	MG/KG	Mean-T	(1)
	Chromium	MG/KG	1.9E+01	4.2E+01 (NP)	1.7E+02		1.2E+01	MG/KG	Mean-T	(3)
	Copper	MG/KG	1.2E+02	3.9E+02 (NP)	1.3E+03		3.3E+01	MG/KG	Mean-T	(3)
	Iron	MG/KG	1.9E+04	2.5E+04 (T)	8.5E+04		1.5E+04	MG/KG	Mean-T	(1)
	Manganese	MG/KG	2.1E+02	3.4E+02 (T)	7.1E+02	J	1.3E+02	MG/KG	Mean-T	(1)
	Mercury	MG/KG	5.5E-01	2.6E+00 (NP)	1.2E+01		1.2E-01	MG/KG	Mean-T	(3)
	Vanadium	MG/KG	2.4E+01	3.4E+01 (NP)	7.0E+01		2.1E+01	MG/KG	Mean-T	(3)
	Zinc	MG/KG	9.6E+03	4.0E+04 (NP)	7.2E+04	L	1.3E+03	MG/KG	Mean-T	(3)

Full statistics for data included in Appendix.

Table 3.2.CTE
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Remedial Investigation Report Site 28
IHDIV-NSWC

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
ProUCL, Version 2.1 used to determine distribution of data using the Shapiro-Wilk W Test. ProUCL used to calculate RME EPC, following recommendations based on distribution and standard deviation in users guide (USEPA. February 2003. ProUCL, Version 2.1. Prepared by Lockheed Martin Environmental Services).
Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of data (Mean-N); Mean of Log-transformed Data (Mean-T).
(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Shapiro-Wilk W Test indicates data neither log-normally or normally distributed. Use distribution data most closely fit.
(4) Shapiro-Wilk W Test indicates data fit both log-normal and normal distribution. Select distribution with higher W Test result.
(5) Mean exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(6) Maximum detected concentration used because sample size is less than 5.

N = Normal
T = Log-Transformed
NP = Non-Parametric
J = Estimated Value

Table 3.3.CTE
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Remedial Investigation Report Site 28
IHDIV-NSWC

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale
Mattawoman Creek	Arsenic	UG/L	2.7E+00	NA	3.8E+00 J	2.7E+00	UG/L	Mean-N	(6)
	Lead	UG/L	2.2E+01	NA	6.2E+01	2.2E+01	UG/L	Mean-N	(6)

Full statistics for data included in Appendix.
For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
ProUCL, Version 2.1 used to determine distribution of data using the Shapiro-Wilk W Test. ProUCL used to calculate RME EPC, following recommendations based on distribution and standard deviation in users guide (USEPA. February 2003. ProUCL, Version 2.1. Prepared by Lockheed Martin Environmental Services).
Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of data (Mean-N); Mean of Log-transformed Data (Mean-T).
(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Shapiro-Wilk W Test indicates data neither log-normally or normally distributed. Use distribution data most closely fit.
(4) Shapiro-Wilk W Test indicates data fit both log-normal and normal distribution. Select distribution with higher W Test result.
(5) Mean exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.
(6) Mean concentration used because sample size is less than 5.

N = Normal
T = Log-Transformed
NP = Non-Parametric
J = Estimated Value

Table 3.4.CTE
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Remedial Investigation Report Site 28
IHDIV-NSWC

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	UCL (Distribution)	Maximum Concentration (Qualifier)		Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Site 28 Soil*										
	Benzo(a)pyrene	MG/KG	2.1E-01	2.9E-01 (NP)	8.1E-01		1.7E-01	MG/KG	Mean-T	(3)
	Benzo(b)fluoranthene	MG/KG	2.3E-01	3.5E-01 (NP)	1.7E+00		1.7E-01	MG/KG	Mean-T	(3)
	Dibenz(a,h)anthracene	MG/KG	2.3E-01	3.0E-01 (NP)	5.0E-01	J	2.3E-01	MG/KG	Mean-N	(3)
	Indeno(1,2,3-cd)pyrene	MG/KG	2.2E-01	3.2E-01 (NP)	1.1E+00		1.7E-01	MG/KG	Mean-T	(3)
	n-Nltroso-di-n-propylamine	MG/KG	2.5E-01	3.3E-01 (NP)	1.0E-01	J	1.0E-01	MG/KG	Max	(5)
	Aluminum	MG/KG	5.7E+03	6.6E+03 (T)	1.5E+04		5.0E+03	MG/KG	Mean-T	(4)
	Antimony	MG/KG	4.5E+00	2.6E+01 (NP)	1.0E+02	L	4.1E-01	MG/KG	97.5% Cheb-m	(3)
	Arsenic	MG/KG	5.0E+01	1.2E+02 (T)	3.8E+02	L	1.5E+01	MG/KG	Mean-T	(1)
	Barium	MG/KG	1.5E+02	4.0E+02 (NP)	3.7E+03		4.9E+01	MG/KG	Mean-T	(3)
	Cadmium	MG/KG	1.2E+01	4.4E+01 (NP)	1.4E+02		1.6E+00	MG/KG	Mean-T	(3)
	Chromium	MG/KG	1.7E+01	3.2E+01 (NP)	1.8E+02		9.7E+00	MG/KG	Mean-T	(3)
	Copper	MG/KG	1.0E+02	3.4E+02 (NP)	2.3E+03		1.9E+01	MG/KG	Mean-T	(3)
	Iron	MG/KG	1.7E+04	2.2E+04 (T)	1.3E+05		1.1E+04	MG/KG	Mean-T	(1)
	Manganese	MG/KG	1.4E+02	2.3E+02 (T)	1.1E+03	J	6.8E+01	MG/KG	Mean-T	(1)
	Mercury	MG/KG	3.0E-01	1.3E+00 (NP)	1.2E+01		6.0E-02	MG/KG	Mean-T	(3)
	Nickel	MG/KG	1.2E+01	1.4E+01 (T)	2.5E+02		5.4E+00	MG/KG	Mean-T	(1)
	Thallium	MG/KG	3.9E-01	4.7E-01 (NP)	8.7E-01	J	3.6E-01	MG/KG	Mean-T	(3)
	Vanadium	MG/KG	2.3E+01	2.7E+01 (T)	9.3E+01	J	1.9E+01	MG/KG	Mean-T	(1)
	Zlnc	MG/KG	6.8E+03	2.4E+04 (NP)	7.2E+04	L	4.9E+02	MG/KG	Mean-T	(3)

* Surface soil & subsurface soil combined.
Full statistics for data included in Appendix.

Table 3.4.CTE
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Remedial Investigation Report Site 28
IHDIV-NSWC

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.
ProUCL, Version 2.1 used to determine distribution of data using the Shapiro-Wilk W Test. ProUCL used to calculate RME EPC, following recommendations based on distribution and standard deviation in users guide (USEPA, February 2003. ProUCL, Version 2.1. Prepared by Lockheed Martin Environmental Services).
Statistics: Maximum Detected Value (Max); 95% UCL of Normal Data (95% UCL-N); 95% UCL of Log-transformed Data, H-Statistic (95% UCL-T); 95% Chebyshev (MVUE) UCL (95% Cheb); 99% Chebyshev (MVUE) UCL (99% Cheb); 95% Chebyshev (mean,std) UCL (95% Cheb-m); 97.5% Chebyshev (mean,std) UCL (97.5% Cheb-m); 99% Chebyshev (mean,std) UCL (99% Cheb-m); Mean of data (Mean-N); Mean of Log-transformed Data (Mean-T).
(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Shapiro-Wilk W Test indicates data neither log-normally or normally distributed. Use distribution data most closely fit.
(4) Shapiro-Wilk W Test indicates data fit both log-normal and normal distribution. Select distribution with higher W Test result.
(5) Mean exceeds maximum detected concentration. Therefore, maximum concentration used for EPC.

N = Normal
T = Log-Transformed
NP = Non-Parametric
J = Estimated Value

Table 3.5.CTE
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Remedial Investigation Report Site 28
IHDIV-NSWC

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of (N/T)	Maximum Concentration (Qualifier)		Exposure Point Concentration			
							Value	Units	Statistic	Rationale
Tap Water	bis(2-Ethylhexyl)phthalate	UG/L	6.4E+01	2.1E+02	2.5E+02	J	6.4E+01	UG/L	Mean-N	(5)
	Aluminum	UG/L	8.2E+03	1.8E+04	1.9E+04	J	8.2E+03	UG/L	Mean-N	(5)
	Antimony	UG/L	1.2E+00	1.9E+00	2.1E+00	J	1.2E+00	UG/L	Mean-N	(5)
	Arsenic	UG/L	1.2E+02	3.1E+02	3.4E+02	J	1.2E+02	UG/L	Mean-N	(5)
	Cadmium	UG/L	1.0E+00	2.8E+00	3.3E+00	J	1.0E+00	UG/L	Mean-N	(5)
	Chromium	UG/L	1.4E+01	2.6E+01	2.7E+01	J	1.4E+01	UG/L	Mean-N	(5)
	Iron	UG/L	1.5E+04	3.2E+04	3.6E+04	J	1.5E+04	UG/L	Mean-N	(5)
	Manganese	UG/L	3.6E+02	6.0E+02	6.0E+02	J	3.6E+02	UG/L	Mean-N	(5)
	Vanadium	UG/L	2.4E+01	5.5E+01	6.2E+01	J	2.4E+01	UG/L	Mean-N	(5)
	Zinc	UG/L	8.1E+02	1.6E+03	1.6E+03	J	8.1E+02	UG/L	Mean-N	(5)
	Aluminum	UG/L	8.2E+03	1.8E+04	8.2E+03		8.2E+03	UG/L	Mean-N	(5)
	Antimony	UG/L	1.2E+00	1.9E+00	3.1E+00	J	1.2E+00	UG/L	Mean-N	(5)
	Arsenic	UG/L	1.2E+02	3.1E+02	3.2E+02		1.2E+02	UG/L	Mean-N	(5)
	Cadmium	UG/L	1.0E+00	2.8E+00	1.0E+01	K	1.0E+00	UG/L	Mean-N	(5)
	Chromium	UG/L	1.4E+01	2.6E+01	1.2E+01	K	1.4E+01	UG/L	Mean-N	(5)
	Iron	UG/L	1.5E+04	3.2E+04	1.5E+04		1.5E+04	UG/L	Mean-N	(5)
	Vanadium	UG/L	2.4E+01	5.5E+01	2.4E+01	J	2.4E+01	UG/L	Mean-N	(5)
	Zinc	UG/L	8.1E+02	1.6E+03	1.2E+03		8.1E+02	UG/L	Mean-N	(5)

Full statistics for data included in Appendix

For non-detects, 1/2 sample quantitation limit was used as a proxy concentration; for duplicate sample results, the maximum value was used in the calculation.

ProUCL, Version 2.1 used to determine distribution of data using the Shapiro-Wilk W Test. (USEPA. February 2003).

Statistics: Maximum Detected Value (Max); Mean of Normally-distrubed Data (Mean-N), Mean of Log-transformed Data (Mean-T).

Table 3.5.CTE
MEDIUM-SPECIFIC EXPOSURE POINT CONCENTRATION SUMMARY
Remedial Investigation Report Site 28
IHDIV-NSWC

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL of (N/T)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic	Rationale

(1) Shapiro-Wilk W Test indicates data are log-normally distributed.
(2) Shapiro-Wilk W Test indicates data are normally distributed.
(3) Shapiro-Wilk W Test indicates data neither log-normally or normally distributed. Use distribution data most closely fit.
(4) Shapiro-Wilk W Test indicates data fit both log-normal and normal distribution. Select distribution with higher W Test result.
(5) Mean concentration used because sample size is less than 5.

J = Estimated Value
NA = Not applicable

TABLE 4.1.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Utility Worker	Adult	Site 28 Soil*	CS	Chemical Concentration in Soil	See Table	mg/kg	See Table	Chronic Daily Intake (CDI) (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	3,300	cm^2	EPA, 2001 (3)	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm^2-day	EPA, 2001 (4)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2001	
				CF1	Conversion Factor 1	0.000001	kg/mg	--	
				EF	Exposure Frequency	10	days/year	(1)	
				ED	Exposure Duration	25	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
Ingestion	Utility Worker	Adult	Site 28 Soil*	CS	Chemical Concentration in Soil	See Table	mg/kg	See Table	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	480	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	10	days/year	(1)	
				ED	Exposure Duration	25	years	EPA, 1991 (2)	
				CF1	Conversion Factor 1	0.000001	kg/mg	--	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

* Surface soil and subsurface soil combined.

Notes:

(1): Professional Judgement assuming 10 days per year.

(2) RME ED assumed to be same as USEPA's recommended ED for industrial workers.

(3) Surface area based on adult worker wearing long pants, short-sleeved shirt, and shoes.

(4) USEPA value for construction worker, 95th percentile.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

TABLE 4.2.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Soil*
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Utility Worker	Adult	Emissions from Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	see Table	mg/m^3	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.32E+09	kg/m^3	EPA, 1996	
				VF	Volatilization Factor for volatile constituents	calc	m^3/kg	EPA, 1996	
				IN	Inhalation Rate	2.5	m^3/hour	EPA, 1997 [3]	
				ET	Exposure Time	8	hr/day	(2)	CA (mg/m3) = CS (1/PEF + 1/VF)
				EF	Exposure Frequency	10	days/year	(1)	
				ED	Exposure Duration	25	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	EPA, 1989	

* Surface soil and subsurface soil combined.

Notes:

(1): Professional Judgement assuming 10 days per year.

(2) Professional Judgement based on maintenance activities that would occur 8 hrs per day for the RME.

(3) Inhalation rate for outdoor worker based on heavy activities.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1996: Soil Screening Guidance: User's Guide, OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.3.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Trespasser	Adult	Site 28 Surface Soil	CS	Chemical Concentration in Soil	see Table	mg/kg	see Table	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,700	cm2	EPA, 2001, (2)	CS x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm2-day	EPA, 2001, (3)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2001	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	24	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
		Adolescent	Site 28 Surface Soil	CS	Chemical Concentration in Soil	see Table	mg/kg	see Table	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	4,400	cm2	EPA, 2001, (4)	CS x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm2-day	EPA, 2001, (5)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2001	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	9	years	(6)	
				BW	Body Weight	51	kg	EPA, 1997,(7)	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
Ingestion	Trespasser	Adult	Site 28 Surface Soil	CS	Chemical Concentration in Soil	See Table	mg/kg	See Table	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
		Adolescent	Site 28 Surface Soil	CS	Chemical Concentration in Soil	See Table	mg/kg	See Table	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	9	years	(6)	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	51	kg	EPA, 1997,(7)	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.3.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 28, IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Current

Medium: Surface Soil

Exposure Medium: Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name

Notes:

(1): Professional Judgement assuming 1 day per week for 52 weeks per year.

(2) SA is based on adult wearing short-sleeved shirt, shorts, and shoes.

(3) SSAF is the 95th percentile for soil adherence for Gardeners.

(4) SA is the total of the head, hands, forearms and lower legs for the 8 through 18 year old, EPA, 2001, Exhibit C-1.

(5) SSAF is the 95th percentile for soil adherence for Soccer Players # 1 (teens).

(6) Assumed adolescent trespasser exposed from age 9 through 18.

(7) Body weight is average of the mean values for boys and girls for the ages 9 through 18.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook, EPA/600/P-95/002Fa.

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

TABLE 4.4.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Trespasser	Adult	Emissions from Site 28 Surface Soil	CS	Chemical Concentration in Soil	see Table	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	see Table	mg/m3	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.32E+09	kg/m3	EPA, 1996	
				VF	Volatilization Factor for volatile constituents	calc	m3/kg	EPA, 1996	
				IN	Inhalation Rate	0.83	m3/hour	EPA, 1991	
				ET	Exposure Time	2	hr/day	(1)	CA (mg/m3) = CS (1/PEF + 1/VF)
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	24	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
	Trespasser	Adolescent	Emissions from Site 28 Soil	CS	Chemical Concentration in Soil	see Table	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	see Table	mg/m3	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.32E+09	kg/m3	EPA, 1996	
				VF	Volatilization Factor for volatile constituents	calc	m3/kg	EPA, 1996	
				IN	Inhalation Rate	0.83	m3/hour	EPA, 1991	
				ET	Exposure Time	2	hr/day	(1)	CA (mg/m3) = CS (1/PEF + 1/VF)
				EF	Exposure Frequency	52	days/year	(2)	
				ED	Exposure Duration	9	years	(3)	
				BW	Body Weight	51	kg	EPA, 1997,(4)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	

Notes:

(1) Professional Judgement assuming trespasser would spend a maximum of 2 hours at the site.

(2) Professional Judgement assuming 1 day per week for 52 weeks per year.

(3) Assumed adolescent trespasser exposed from age 9 through 18.

(4) Body weight is average of the mean values for boys and girls for the ages 9 through 18.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.5.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreation	Adult	Mattawoman Creek	CSW	Chemical Concentration in Surface Water	see Table	µg/l	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-SW	Ingestion Rate of Surface Water	0.025	l/hour	EPA, 1989, (3)	CSW x IR-SW x ET x EF x ED x CF1 x
				ET	Exposure Time	2.6	hr/day	EPA, 1989	1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Adolescent	Mattawoman Creek	CSW	Chemical Concentration in Surface Water	see Table	µg/l	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-SW	Ingestion Rate of Surface Water	0.025	l/hour	EPA, 1989, (3)	CSW x IR-SW x ET x EF x ED x CF1 x
				ET	Exposure Time	2.6	hr/day	EPA, 1989	1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	9	years	EPA, 1993	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	51	kg	EPA, 1997,(2)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
Dermal	Recreation	Adult	Mattawoman Creek	CSW	Chemical Concentration in Surface Water	see Table	µg/l	- -	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	mg/cm^2-event	calculated	EPA, 2001	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	3,120	cm2	EPA, 1997 (4)	
				Kp	Permeability Coefficient	chem specific	cm/hr	EPA, 2001	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chem specific	hours	EPA, 2001	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chem specific	hours	EPA, 2001	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chem specific	dimensionless	EPA, 2001	Organics :
				t_{event}	Event Time	2.6	hr/day	EPA, 1989	t_{event}<t*: DAevent (mg/cm^2-event) =
				CF1	Conversion Factor 1	0.001	mg/µg	- -	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EF	Exposure Frequency	52	days/year	(1)	x CF1 x CF2
				ED	Exposure Duration	24	years	EPA, 1991	
				CF2	Conversion Factor 2	0.001	l/cm3	- -	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + 3B^2)/(1+B)^2)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	

TABLE 4.5.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 28, IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Current/Future

Medium: Surface Water

Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Recreation	Adolescent	Mattawoman Creek	CSW	Chemical Concentration in Surface Water	see Table	µg/l	- -	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	mg/cm^2-event	calculated	EPA, 2001	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	2,630	cm2	EPA, 1997 (5)	
				Kp	Permeability Coefficient	chem specific	cm/hr	EPA, 2001	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chem specific	hours	EPA, 2001	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chem specific	hours	EPA, 2001	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chem specific	dimensionless	EPA, 2001	Organics :
				t_{event}	Event Time	2.6	hr/day	EPA, 1989	t_{event}<t*: DAevent (mg/cm^2-event) =
				CF1	Conversion Factor 1	0.001	mg/µg	- -	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EF	Exposure Frequency	52	days/year	(1)	x CF1 x CF2
				ED	Exposure Duration	9	years	EPA, 1993	
				CF2	Conversion Factor 2	0.001	l/cm3	- -	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	51	kg	EPA, 1997,(2)	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + 3B^2)/(1+B)^2)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	

Notes:

(1) Professional Judgement assuming 1 day per week for 52 weeks per year.

(2) Body weight is average of the mean values for boys and girls for the ages 9 through 18.

(3) Professional Judgment assuming one half of the ingestion rate specified for swimming.

(4) SA is the sum of the mean surface areas (for a male) of the hands and arms (includes upper arms and forearms).

(5) Based on average total body surface area (for male) children ages 9 - 18 for hands and arms (includes upper arms and forearms).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2000: Supplemental Guidance to RAGS: Region 4 Bulletins

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

TABLE 4.6.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Adult	Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	--	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,700	cm^2	EPA, 2001 (2)	CS x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm^2-day	EPA, 2001 (2)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 1995, 2001	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	24	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Child	Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	--	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	2,800	cm^2	EPA, 2001 (2)	CS x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm^2-day	EPA, 2001 (2)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 1995, 2001	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	6	years	EPA, 1991	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	--	CDI (mg/kg-day) =
				SA-A	Skin Surface Area Available for Contact, Adult	5,700	cm^2	EPA, 2001 (2)	CS x DA-Adj x DABS x CF3 x EF x 1/AT
				SA-C	Skin Surface Area Available for Contact, Child	2,800	cm^2	EPA, 2001 (2)	
				SSAF-A	Soil to Skin Adherence Factor, Adult	0.07	mg/cm^2-day	EPA, 2001 (2)	
				SSAF-C	Soil to Skin Adherence Factor, Child	0.2	mg/cm^2-day	EPA, 2001 (2)	DA-Adj (mg-year/kg-day) =
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 1995, 2001	
				DA-Adj	Dermal Absorption, Age-adjusted	361	mg-year/kg-day	calculated	[(ED-C x SA-C / BW-C)*SSAF-C + (ED-A x SA-A / BW-A)*SSAF-A]
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED-A	Exposure Duration, Adult	24	years	EPA, 1991	
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.6.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Construction Worker	Adult	Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	- -	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	3,300	cm^2	EPA, 2001 (3)	CS x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm^2-day	EPA, 2001 (4)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 1995, 2001	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	250	days/year	EPA, 1991	
				ED	Exposure Duration	1	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	
Dermal	Trespasser	Adolescent	Site 28 Surface Soil	CS	Chemical Concentration in Soil	see Table	mg/kg	see Table	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	4,400	cm2	EPA, 2001, (5)	CS x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm2-day	EPA, 2001, (6)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2001	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	9	years	(8)	
				BW	Body Weight	51	kg	EPA, 1997,(7)	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
Dermal	Trespasser	Adult	Site 28 Surface Soil	CS	Chemical Concentration in Soil	see Table	mg/kg	see Table	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,700	cm2	EPA, 2001, (9)	CS x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm2-day	EPA, 2001, (10)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2001	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	24	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.6.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	--	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Child	Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	--	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	200	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	--	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S-A	Ingestion Rate of Soil, Adult	100	mg/day	EPA, 1991	CS x IR-S-Adj x EF x CF3 x 1/AT
				IR-S-C	Ingestion Rate of Soil, Child	200	mg/day	EPA, 1991	
				IR-S-Adj	Ingestion Rate of Soil, Age-adjusted	114	mg-year/kg-day	calculated	IR-S-Adj (mg-year/kg-day) = (ED-C x IR-S-C / BW-C) + (ED-A x IR-S-A / BW-A)
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED-A	Exposure Duration, Adult	24	years	EPA, 1991	
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
	Construction Worker	Adult	Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	--	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	480	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	250	days/year	EPA, 1991	
				ED	Exposure Duration	1	years	EPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	

TABLE 4.6.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Trespasser	Adolescent	Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	see Table	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	100	mg/day		CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	9	years		
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				BW	Body Weight	51	kg	EPA, 1997,(7)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
		Adult	Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	see Table	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	100	mg/day		CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	52	days/year	(1)	
				ED	Exposure Duration	24	years		
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	

* Surface soil and subsurface soil combined.
(1) Professional Judgement assuming 1 day per week for 52 weeks per year.
(2) USEPA recommended value for adult and child resident (USEPA, 2001).
(3) USEPA recommened value for adult worker (USEPA, 2001).
(4) USEPA value for construction worker, 95th percentile (USEPA, 2001).
(5) SA is the total of the head, hands, forearms and lower legs for the 8 through 18 year old, EPA, 2001, Exhibit C-1.
(6) SSAF is the 95th percentile for soil adherence for Soccer Players # 1 (teens).
(7) Body weight is average of the mean values for boys and girls for the ages 9 through 18.
(8) Assumed adolescent trespasser exposed from age 9 through 18.
(9) SA is based on adult wearing short-sleeved shirt, shorts, and shoes.
(10) SSAF is the 95th percentile for soil adherence for Gardeners.
Sources:
EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.
EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.
EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.
EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

TABLE 4.7.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Adult	Emissions from Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	--	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	see Table	mg/m3	--	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.32E+09	m3/kg	EPA, 1996	
				VF	Volatilization Factor for volatile constituents	calc	m3/kg	EPA, 1996	
				IN	Inhalation Rate	0.83	m^3/hour	EPA, 1991	
				ET	Exposure Time	24	hr/day	(1)	CA (mg/m3) = CS (1/PEF + 1/VF)
				EF	Exposure Frequency	350	days/year	EPA, 2001	
				ED	Exposure Duration	24	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Child	Emissions from Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	--	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	see Table	mg/m3	--	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.32E+09	kg/m3	EPA, 1996	
				VF	Volatilization Factor for volatile constituents	calc	m3/kg	EPA, 1996	
				IN	Inhalation Rate	0.5	m^3/hour	EPA, 1997	
				ET	Exposure Time	24	hr/day	(1)	CA (mg/m3) = CS (1/PEF + 1/VF)
				EF	Exposure Frequency	350	days/year	EPA, 2001	
				ED	Exposure Duration	6	years	EPA, 1989	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Emissions from Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	--	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	see Table	mg/m3	--	CA x IN-S-Adj x ET x EF x 1/AT
				PEF	Particulate Emissions Factor	1.32E+09	kg/m3	EPA, 1996	
				VF	Volatilization Factor for volatile constituents	calc	m3/kg	EPA, 1996	IN-S-Adj (m3-year/kg-hour) =
				IN-S-A	Inhalation Rate, Adult	0.83	m3/hour	EPA, 1991	(ED-C x IN-S-C / BW-C) + (ED-A x IN-S-A / BW-A)
				IN-S-C	Inhalation Rate, Child	0.5	m3/hour	EPA, 1997	
				IN-S-Adj	Inhalation Rate, Age-adjusted	11.6	m^3-year/kg-day	calculated	
				ET	Exposure Time	24	hours/day	(1)	CA (mg/m3) = CS (1/PEF + 1/VF)
				EF	Exposure Frequency	350	days/year	EPA, 2001	
				ED-A	Exposure Duration, Adult	24	years	EPA, 1993	
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				BW-A	Body Weight, Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.7.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
	Construction Worker	Adult	Emissions from Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	see Table	mg/m3	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.32E+09	kg/m3	EPA, 1996	
				VF	Volatilization Factor for volatile constituents	calc	m3/kg	EPA, 1996	
				IN	Inhalation Rate	2.5	m3/hour	EPA, 1997 (6)	
				ET	Exposure Time	8	hr/day	(1)	CA (mg/m3) = CS (1/PEF + 1/VF)
				EF	Exposure Frequency	250	days/year	EPA, 1993	
				ED	Exposure Duration	1	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	
	Trespasser	Adolescent	Emissions from Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	see Table	mg/m3	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.32E+09	kg/m3	EPA, 1996	
				VF	Volatilization Factor for volatile constituents	calc	m3/kg	EPA, 1996	
				IN	Inhalation Rate	1.4	m3/hour	EPA, 1997 (7)	
				ET	Exposure Time	2	hr/day	(2)	CA (mg/m3) = CS (1/PEF + 1/VF)
				EF	Exposure Frequency	52	days/year	(3)	
				ED	Exposure Duration	9	years	(4)	
				BW	Body Weight	51	kg	EPA, 1997,(5)	
				AT-C	Averaging Time (Cancer)	25550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	days	EPA, 1989	
		Adult	Emissions from Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	see Table	mg/m3	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.32E+09	kg/m3	EPA, 1996	
				VF	Volatilization Factor for volatile constituents	calc	m3/kg	EPA, 1996	
				IN	Inhalation Rate	1.6	m3/hour	EPA, 1997 (8)	
				ET	Exposure Time	2	hr/day	(2)	CA (mg/m3) = CS (1/PEF + 1/VF)
				EF	Exposure Frequency	52	days/year	(3)	
				ED	Exposure Duration	24	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8760	days	EPA, 1989	

* Surface soil and subsurface soil combined.

TABLE 4.7.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 28, IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future

Medium: Soil*

Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name

(1) Professional Judgement, conservatively assumed all day.

(2) Professional Judgement assuming trespasser would spend a maximum of 2 hours at the site.

(3) Professional Judgement assuming 1 day per week for 52 weeks per year for the RME.

(4) Professional Judgement assuming adolescents from 9 to 18 years of age.

(5) Body weight is average of the mean values for boys and girls for the ages 9 through 18.

(6) Inhalation rate is based on values for the outdoor worker assuming heavy activity (EPA, 1997, page 5-24).

(7) Assumed moderate activity level, short-term exposure for males/females ages 10 to 18, Table 5-14, EPA, 1997.

(8) Assumed moderate activity level, short-term exposure for adults, Table 5-23, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund, Vol.1: Human Health Evaluation Manual, Part A. OERR, EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund, Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2001: Risk Assessment Guidance for Superfund, Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

TABLE 4.8.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	Tap Water	CW	Chemical Concentration in Water	See Table ---	µg/l	See Table ---	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate of Water	2	liters/day	EPA, 1997	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	24	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Child	Tap Water	CW	Chemical Concentration in Water	See Table ---	µg/l	See Table ---	CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1	liters/day	EPA, 1997	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Tap Water	CW	Chemical Concentration in Water	See Table ---	µg/l	See Table ---	CDI (mg/kg-day) =
				IR-W-A	Ingestion Rate of Water, Adult	2	liters/day	EPA, 1997	CW x IR-W-Adj x EF x CF1 x 1/AT
				IR-W-C	Ingestion Rate of Water, Child	1	liters/day	EPA, 1997	
				IR-W-Adj	Ingestion Rate of Water, Age-adjusted	1.09	liter-year/kg-day	calculated	IR-W-Adj (liter-year/kd-day) =
				EF	Exposure Frequency	350	days/year	EPA, 1991	(ED-C x IR-W-C / BW-C) +
				ED-A	Exposure Duration, Adult	24	years	EPA, 1991	(ED-A x IR-W-A / BW-A)
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.8.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Adult	Tap Water	CW	Chemical Concentration in Water	See Table ---	µg/l	See Table ---	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2001	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2001	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2001	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2001	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2001	Organics :
				t_{event}	Event Time	0.58	hr/event	EPA, 2001	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	18,000	cm^2	EPA, 2001	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2001	x CF1 x CF2
				EF	Exposure Frequency	350	days/year	EPA, 2001	
				ED	Exposure Duration	24	years	EPA, 2001	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + 3B^2)/(1+B)^2)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	
		Child	Tap Water	CW	Chemical Concentration in Water	See Table ---	µg/l	See Table ---	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2001	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2001	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2001	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2001	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2001	Organics :
				t_{event}	Event Time	1.0	hr/event		t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	6,600	cm^2	EPA, 2001	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2001	x CF1 x CF2
				EF	Exposure Frequency	350	days/year	EPA, 2001	
				ED	Exposure Duration	6	years	EPA, 2001	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	15	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + 3B^2)/(1+B)^2)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	2190	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

TABLE 4.8.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

Site 28, IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal (cont'd)	Resident	Child/Adult	Tap Water	CW	Chemical Concentration in Water	See Table ---	µg/l	See Table ---	CDI (mg/kg-day) = DA-Adj x EF x 1/AT
				DAevent-A	Dermally Absorbed Dose per Event, Adult	calculated	mg/cm^2-event	calculated	
				DAevent-C	Dermally Absorbed Dose per Event, Child	calculated	mg/cm^2-event	calculated	DA-Adj = (Daevent-A x SA-A x ED-A x 1/BW-A)
				DA-Adj	Dermally Absorbed Dose, Age-adjusted	calculated	mg-year/event-kg	calculated	+ (Daevent-C x SA-C x ED-C x 1/BW-C)
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2001	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2001	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2001	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2001	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2001	Organics :
				t_{event}-A	Event Time, Adult	0.58	hr/event	EPA, 2001	t_{event}<t*: DAevent (mg/cm^2-event) =
				t_{event}-C	Event Time, Child	1.0	hr/event	EPA, 2001	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				SA-A	Skin Surface Area, Adult	18,000	cm^2	EPA, 2001	x CF1 x CF2
				SA-C	Skin Surface Area, Child	6,600	cm^2	EPA, 2001	
				EV	Event Frequency	1	events/day	EPA, 2001	t_{event}>t*: DAevent (mg/cm^2-event) =
				EF	Exposure Frequency	350	days/year	EPA, 2001	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				ED-A	Exposure Duration, Adult	24	years	EPA, 2001	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				ED-C	Exposure Duration, Child	6	years	EPA, 2001	
				BW-A	Body Weight, Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	ke	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

TABLE 4.8.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal (cont'd)	Construction Worker	Adult	Water in Excavation Pit	CW	Chemical Concentration in Water	See Table ---	µg/l	See Table ---	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2001	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2001	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2001	Kp x CW x t_{event} x CF1 x CF2
				t^*	Time to Reach Steady-state	chemical specific	hours	EPA, 2001	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2001	Organics :
				t_{event}	Event Time	8	hr/day	(1)	$t_{event}<t^*$: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	3,300	cm^2	EPA, 2001 (2)	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2001	x CF1 x CF2
				EF	Exposure Frequency	250	days/year	EPA, 1991	
				ED	Exposure Duration	1	years	EPA, 1991	$t_{event}>t^*$: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

(1) Professional Judgement based on construction activities that would occur 8 hrs per day for the RME.
(2) USEPA recommened value for adult worker (USEPA, 2001).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

TABLE 4.9.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Adult	Water Vapors at showerhead	CW	Chemical Concentration in Water	See Table ---	µg/l	See Table ---	Chronic Daily Intake (CDI) (mg/kg-day) =
				InhExp	Inhalation Exposure per Shower	calculated	mg/kg-shower		InhExp x EF x ED x 1/AT
				EF	Exposure Frequency	350	days/year	EPA, 1991	Foster & Chrostowski Shower Inhalation Model
				ED	Exposure Duration	24	years	EPA, 1991	for InhExp
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
	Construction Worker	Adult	Water Vapors at Excavation Pit	CW	Chemical Concentration in Water	See Table ---	µg/l	See Table ---	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	calculated	mg/m^3		CA x IN x ET x EF x ED x 1/BW x 1/AT
				IN	Inhalation Rate	2.5	m^3/hour	EPA, 1991	
				ET	Exposure Time	8	hr/day	(1)	CA calculated using two-film model
				EF	Exposure Frequency	125	days/year	(2)	
				ED	Exposure Duration	1	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	

Notes:

(1) Professional Judgement based on construction activities that would occur 8 hrs per day for the RME.

(2) Assumed duration of construction project may be 1/2 a year.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

TABLE 4.1.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURE
Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Utility Worker	Adult	Site 28 Soil*	CS	Chemical Concentration in Soil	See Table	mg/kg	See Table	Chronic Daily Intake (CDI) (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	2,000	cm^2	EPA, 2001 (2)	CS x SA x SSAF x DABS x CF1 x EF x
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm^2-day	EPA, 2001 (3)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2001	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				EF	Exposure Frequency	5	days/year	(1)	
				ED	Exposure Duration	5	years	EPA, 1993	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	1,825	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	EPA, 1989	
Ingestion	Utility Worker	Adult	Site 28 Soil*	CS	Chemical Concentration in Soil	See Table	mg/kg	See Table	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	50	mg/day	EPA, 1993	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	5	days/year	(1)	
				ED	Exposure Duration	5	years	EPA, 1993	
				CF1	Conversion Factor 1	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	1,825	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

* Surface soil and subsurface soil combined.

Notes:

(1): Professional Judgement assuming 5 days per year.

(2) CT SA is the sum of the mean surface areas (for a male) of the head and hands.

(3) Soil to skin adherence factor is based on 50th percentile weighted adherence factor for utility workers.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A, OERR. EPA/540/1-89/002.
EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.
EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

TABLE 4.2.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 28, IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Current
Medium: Soil*
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Utility Worker	Adult	Emissions from Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	calculated	mg/m^3	calculated	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.32E+09	kg/m^3	EPA, 1996	
				VF	Volatilization Factor for volatile constituents	calc	m^3/kg	EPA, 1996	
				IN	Inhalation Rate	1.5	m^3/hour	EPA, 1997 (2)	
				ET	Exposure Time	4	hr/day	(3)	CA (mg/m3) = CS (1/PEF + 1/VF)
				EF	Exposure Frequency	5	days/year	(1)	
				ED	Exposure Duration	5	years	EPA, 1993	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	1825	days	EPA, 1989	

* Surface soil and subsurface soil combined.

Notes:

(1): Professional Judgement assuming 5 days per year.

(2) Inhalation rate for outdoor worker based on moderate activities.

(3) Professional Judgement based on activities that would occur 4 hrs per day.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund, Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

EPA, 2002: Region III Risk-Based Concentration Table. October 9, 2002.

TABLE 4.3.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Trespasser	Adult	Site 28 Surface Soil	CS	Chemical Concentration in Soil	see Table	mg/kg	see Table	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	2,000	cm2	EPA, 1992, (2)	CS x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm2-day	EPA, 2001, (3)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2001	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	9	years	EPA, 1993	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
		Adolescent	Site 28 Surface Soil	CS	Chemical Concentration in Soil	see Table	mg/kg	see Table	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	3,700	cm2	EPA, 1992	CS x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.04	mg/cm2-day	EPA, 2001, (4)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2001	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	9	years	EPA, 1993	
				BW	Body Weight	51	kg	EPA, 1997, (5)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
Ingestion	Trespasser	Adult	Site 28 Surface Soil	CS	Chemical Concentration in Soil	See Table	mg/kg	See Table	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	50	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	9	years	EPA, 1993	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	3285	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	EPA, 1989	

TABLE 4.3.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURE
Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Surface Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Trespasser	Adolescent	Site 28 Surface Soil	CS	Chemical Concentration in Soil	See Table	mg/kg	See Table	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	50	mg/day	EPA, 1991	CS x IR-S x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	9	years	EPA, 1993	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	51	kg	EPA, 1997,(5)	
				AT-N	Averaging Time (Non-Cancer)	8760	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25550	days	EPA, 1989	

Notes:
(1): Professional Judgement assuming 1 day per week for 26 weeks per year.
(2) SA is the sum of the mean surface areas (for a male) of the head and hands.
(3) SSAF is the geometric mean for soil adherence for Gardeners.
(4) SSAF is the geometric mean for soil adherence for Soccer Players # 1 (teens).
(4) Body weight is average of the mean values for boys and girls for the ages 9 through 18.
Sources:
EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.
EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure,
EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.
EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

TABLE 4.4.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURE
Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Medium: Surface Soil
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Trespasser	Adult	Emissions from Site 28 Surface Soil	CS	Chemical Concentration in Soil	see Table	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	see Table	mg/m3	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.32E+09	kg/m3	EPA, 1996	
				VF	Volatilization Factor for volatile constituents	calc	m3/kg	EPA, 1996	
				IN	Inhalation Rate	0.5	m3/hour	EPA, 1997 (2)	
				ET	Exposure Time	1.8	hr/day	(1)	CA (mg/m3) = CS (1/PEF + 1/VF)
				EF	Exposure Frequency	26	days/year	(3)	
				ED	Exposure Duration	9	years	EPA, 1993	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
	Trespasser	Adolescent	Emissions from Site 28 Soil	CS	Chemical Concentration in Soil	see Table	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	see Table	mg/m3	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.32E+09	kg/m3	EPA, 1996	
				VF	Volatilization Factor for volatile constituents	calc	m3/kg	EPA, 1996	
				IN	Inhalation Rate	0.542	m3/hour	EPA, 1997, (6)	
				ET	Exposure Time	1.8	hr/day	(1)	CA (mg/m3) = CS (1/PEF + 1/VF)
				EF	Exposure Frequency	26	days/year	(3)	
				ED	Exposure Duration	9	years	(4)	
				BW	Body Weight	51	kg	EPA, 1997,(5)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	

Notes:
(1) Professional Judgement assuming trespasser would spend a maximum of 1.8 hours at the site.
(2) Inhalation rate for adult, sedentary activities.
(3) Professional Judgement assuming 1 day per week for 26 weeks per year.
(4) Professional Judgement assuming adolescents from 9 to 18 years of age.
(5) Body weight is average of the mean values for boys and girls for the ages 9 through 18.
(6) Average of Long-term exposure of male and female ages 9-18, Table 5-23, EFH 1997.

Sources:
EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.
EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.
EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.
EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.
EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.
EPA, 1999: Risk-Based Concentration Table. October 27, 1999.

TABLE 4.5.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURE
Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Recreation	Adult	Mattawoman Creek	CSW	Chemical Concentration in Surface Water	see Table	µg/l	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-SW	Ingestion Rate of Surface Water	0.025	l/hour	EPA, 1989, (3)	CSW x IR-SW x ET x EF x ED x CF1 x
				ET	Exposure Time	2.6	hr/day	EPA, 1989	1/BW x 1/AT
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	9	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
		Adolescent	Mattawoman Creek	CSW	Chemical Concentration in Surface Water	see Table	µg/l	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-SW	Ingestion Rate of Surface Water	0.025	l/hour	EPA, 1989, (3)	CSW x IR-SW x ET x EF x ED x CF1 x
				ET	Exposure Time	2.6	hr/day	EPA, 1989	1/BW x 1/AT
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	9	years	EPA, 1993	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	51	kg	EPA, 1997,(2)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
Dermal	Recreation	Adult	Mattawoman Creek	CSW	Chemical Concentration in Surface Water	see Table	µg/l	- -	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	mg/cm^2-event	calculated	EPA, 2001	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	3,120	cm2	EPA, 1997 (4)	
				Kp	Permeability Coefficient	chem specific	cm/hr	EPA, 2001	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chem specific	hours	EPA, 2001	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chem specific	hours	EPA, 2001	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chem specific	dimensionless	EPA, 2001	Organics :
				t_{event}	Event Time	2.6	hr/day	EPA, 1989	t_{event}<t*: DAevent (mg/cm^2-event) =
				CF1	Conversion Factor 1	0.001	mg/µg	- -	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EF	Exposure Frequency	26	days/year	(1)	x CF1 x CF2
				ED	Exposure Duration	9	years	EPA, 1991	
				CF2	Conversion Factor 2	0.001	l/cm3	- -	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + 3B^2)/(1+B)^2)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	

TABLE 4.5.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 28, IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Current/Future

Medium: Surface Water

Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Recreation	Adolescent	Mattawoman Creek	CSW	Chemical Concentration in Surface Water	see Table	µg/l	- -	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	mg/cm^2-event	caiculated	EPA, 2001	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				SA	Skin Surface Area Available for Contact	2,630	cm2	EPA, 1997 (5)	
				Kp	Permeability Coefficient	chem specific	cm/hr	EPA, 2001	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chem specific	hours	EPA, 2001	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chem specific	hours	EPA, 2001	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chem specific	dimensionless	EPA, 2001	Organics :
				t_{event}	Event Time	2.6	hr/day	EPA, 1989	t_{event}<t*: DAevent (mg/cm^2-event) =
				CF1	Conversion Factor 1	0.001	mg/µg	- -	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EF	Exposure Frequency	26	days/year	(1)	x CF1 x CF2
				ED	Exposure Duration	9	years	EPA, 1993	
				CF2	Conversion Factor 2	0.001	l/cm3	- -	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	51	kg	EPA, 1997,(2)	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + 3B^2)/(1+B)^2)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	

Notes:

(1) Professional Judgement assuming 1 day per week for 26 weeks per year.

(2) Body weight is average of the mean values for boys and girls for the ages 9 through 18.

(3) Professional Judgment assuming one half of the ingestion rate specified for swimming.

(4) SA is the sum of the mean surface areas (for a male) of the hands and arms (includes upper arms and forearms).

(5) Based on average total body surface area (for male) children ages 9 - 18 for hands and arms (includes upper arms and forearms).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2000: Supplemental Guidance to RAGS: Region 4 Bulletins

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

TABLE 4.6.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURE
Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Adult	Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	--	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,700	cm^2	EPA, 2001 (2)	CS x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.07	mg/cm^2-day	EPA, 2001 (2)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 1995, 2001	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	9	years	EPA, 1993	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
		Child	Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	--	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	2,800	cm2	EPA, 2001 (2)	CS x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.2	mg/cm^2-day	EPA, 2001 (2)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 1995, 2001	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	6	years	EPA, 1991	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	--	CDI (mg/kg-day) =
				SA-A	Skin Surface Area Available for Contact, Adult	5,700	cm^2	EPA, 2001 (2)	CS x DA-Adj x DABS x CF3 x EF x 1/AT
				SA-C	Skin Surface Area Available for Contact, Child	2,800	cm^2	EPA, 2001 (2)	
				SSAF-A	Soil to Skin Adherence Factor, Adult	0.07	mg/cm^2-day	EPA, 2001 (2)	
				SSAF-C	Soil to Skin Adherence Factor, Child	0.2	mg/cm^2-day	EPA, 2001 (2)	DA-Adj (mg-year/kg-day) =
				DA-Adj	Dermal Absorption, Age-adjusted	275.3	mg-year/kg-day	calculated	[(ED-C x SA-C / BW-C)*SSAF-C + (ED-A x SA-A / BW-A)*SSAF-A]
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED-A	Exposure Duration, Adult	9	years	EPA, 1993	
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.6.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURE
Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Construction Worker	Adult	Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	- -	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	3,300	cm^2	EPA, 2001 (3)	CS x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.1	mg/cm^2-day	EPA, 2001 (4)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 1995, 2001	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	219	days/year	EPA, 1993	
				ED	Exposure Duration	1	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	
Dermal	Trespasser	Adolescent	Site 28 Surface Soil	CS	Chemical Concentration in Soil	see Table	mg/kg	see Table	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	4,400	cm2	EPA, 2001, (5)	CS x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm2-day	EPA, 2001, (6)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2001	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	9	years	(8)	
				BW	Body Weight	51	kg	EPA, 1997,(7)	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
Dermal	Trespasser	Adult	Site 28 Surface Soil	CS	Chemical Concentration in Soil	see Table	mg/kg	see Table	CDI (mg/kg-day) =
				SA	Skin Surface Area Available for Contact	5,700	cm2	EPA, 2001, (9)	CS x SA x SSAF x DABS x CF3 x EF x
				SSAF	Soil to Skin Adherence Factor	0.3	mg/cm2-day	EPA, 2001, (10)	ED x 1/BW x 1/AT
				DABS	Dermal Absorption Factor Solids	chem specific	--	EPA, 2001	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	9	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.6.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURE
Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	--	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	50	mg/day	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	9	years	EPA, 1993	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
		Child	Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	--	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	--	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S-A	Ingestion Rate of Soil, Adult	50	mg/day	EPA, 1993	CS x IR-S-Adj x EF x CF3 x 1/AT
				IR-S-C	Ingestion Rate of Soil, Child	100	mg/day	EPA, 1993	
				IR-S-Adj	Ingestion Rate of Soil, Age-adjusted	46.43	mg-year/kg-day	calculated	IR-S-Adj (mg-year/kg-day) = (ED-C x IR-S-C / BW-C) + (ED-A x IR-S-A / BW-A)
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED-A	Exposure Duration, Adult	9	years	EPA, 1993	
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
	Construction Worker	Adult	Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	--	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	100	mg/day	EPA, 1997	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	219	days/year	EPA, 1993	
				ED	Exposure Duration	1	years	EPA, 1991	
				CF3	Conversion Factor 3	0.000001	kg/mg	--	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	

TABLE 4.6.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Soil*

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Trespasser	Adolescent	Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	see Table	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	50	mg/day	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	9	years	EPA, 1993	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	51	kg	EPA, 1997,(7)	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
		Adult	Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	see Table	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-S	Ingestion Rate of Soil	50	mg/day	EPA, 1993	CS x IR-S x EF x ED x CF3 x 1/BW x 1/AT
				EF	Exposure Frequency	26	days/year	(1)	
				ED	Exposure Duration	9	years	EPA, 1993	
				CF3	Conversion Factor 3	0.000001	kg/mg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	

* Surface soil and subsurface soil combined.

(1) Professional Judgement assuming 1 day per week for 26 weeks per year.

(2) USEPA recommended value for adult and child resident (USEPA, 2001).

(3) USEPA recommened value for adult worker (USEPA, 2001).

(4) USEPA value for construction worker, geometric mean (USEPA, 2001).

(5) SA is the totai of the head, hands, forearms and lower legs for the 8 through 18 year old, EPA, 2001, Exhibit C-1.

(6) SSAF is the 95th percentile for soil adherence for Soccer Players # 1 (teens).

(7) Body weight is average of the mean values for boys and girls for the ages 9 through 18.

(8) Assumed adolescent trespasser exposed from age 9 through 18.

(9) SA is based on adult wearing short-sleeved shirt, shorts, and shoes.

(10) SSAF is the 95th percentile for soil adherence for Gardeners.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund, Vol.1: Human Health Evaluation Manual, Part A, OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund, Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1992: Dermal Exposure Assessment: Principals and Applications. ORD. EPA/600/8-91/011B.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1995: Assessing Dermal Exposure from Soil. EPA Region III. EPA/903-K-95-003.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

TABLE 4.7.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Adult	Emissions from Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	--	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	see Table	mg/m3	--	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.32E+09	m3/kg	EPA, 1996	
				VF	Volatilization Factor for volatile constituents	calc	m3/kg	EPA, 1996	
				IN	Inhalation Rate	0.55	m^3/hour	EPA, 1997 (9)	
				ET	Exposure Time	12	hr/day	(1)	CA (mg/m3) = CS (1/PEF + 1/VF)
				EF	Exposure Frequency	234	days/year	EPA, 2001	
				ED	Exposure Duration	9	years	EPA, 1993	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8,760	days	EPA, 1989	
		Child	Emissions from Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	--	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	see Table	mg/m3	--	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.32E+09	kg/m3	EPA, 1996	
				VF	Volatilization Factor for volatile constituents	calc	m3/kg	EPA, 1996	
				IN	Inhalation Rate	0.35	m^3/hour	EPA, 1997 (9)	
				ET	Exposure Time	12	hr/day	(1)	CA (mg/m3) = CS (1/PEF + 1/VF)
				EF	Exposure Frequency	234	days/year	EPA, 2001	
				ED	Exposure Duration	6	years	EPA, 1991	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2190	days	EPA, 1989	
		Child/Adult	Emissions from Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	--	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	see Table	mg/m3	--	CA x IN-S-Adj x ET x EF x 1/AT
				PEF	Particulate Emissions Factor	1.32E+09	kg/m3	EPA, 1996	
				VF	Volatilization Factor for volatile constituents	calc	m3/kg	EPA, 1996	IN-S-Adj (m3-year/kg-hour) =
				IN-S-A	Inhalation Rate, Adult	0.55	m^3/hour	EPA, 1997 (9)	(ED-C x IN-S-C / BW-C) + (ED-A x IN-S-A / BW-A
				IN-S-C	Inhalation Rate, Child	0.35	m^3/hour	EPA, 1997 (9)	
				IN-S-Adj	Inhalation Rate, Age-adjusted	2.5	m3-year/kg-hour	calculated	
				ET	Exposure Time	12	hr/day	(1)	CA (mg/m3) = CS (1/PEF + 1/VF)
				EF	Exposure Frequency	234	days/year	EPA, 2001	
				ED-A	Exposure Duration, Adult	9	years	EPA, 1993	
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				BW-A	Body Weight, Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25550	days	EPA, 1989	

TABLE 4.7.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
	Construction Worker	Adult	Emissions from Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	see Table	mg/m3	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.32E+09	kg/m3	EPA, 1996	
				VF	Volatilization Factor for volatile constituents	calc	m3/kg	EPA, 1996	
				IN	Inhalation Rate	1.5	m3/hour	EPA, 1997 (6)	
				ET	Exposure Time	4	hr/day	(7)	CA (mg/m3) = CS (1/PEF + 1/VF)
				EF	Exposure Frequency	219	days/year	EPA, 1993	
				ED	Exposure Duration	1	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	
	Trespasser	Adolescent	Emissions from Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	see Table	mg/m3	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.32E+09	kg/m3	EPA, 1996	
				VF	Volatilization Factor for volatile constituents	calc	m3/kg	EPA, 1996	
				IN	Inhalation Rate	0.72	m3/hour	EPA, 1997 (11)	
				ET	Exposure Time	2	hr/day	(3)	CA (mg/m3) = CS (1/PEF + 1/VF)
				EF	Exposure Frequency	26	days/year	(4)	
				ED	Exposure Duration	9	years	(5)	
				BW	Body Weight	51	kg	EPA, 1997,(8)	
				AT-C	Averaging Time (Cancer)	25550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3285	days	EPA, 1989	
		Adult	Emissions from Site 28 Soil*	CS	Chemical Concentration in Soil	see Table	mg/kg	- -	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	see Table	mg/m3	- -	CA x IN x ET x EF x ED x 1/BW x 1/AT
				PEF	Particulate Emissions Factor	1.32E+09	kg/m3	EPA, 1996	
				VF	Volatilization Factor for volatile constituents	calc	m3/kg	EPA, 1996	
				IN	Inhalation Rate	0.83	m3/hour	EPA, 1999	
				ET	Exposure Time	1	m3/hour	EPA, 1997 (10)	CA (mg/m3) = CS (1/PEF + 1/VF)
				EF	Exposure Frequency	26	days/year	(4)	
				ED	Exposure Duration	9	years	EPA, 1993	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	8760	days	EPA, 1989	

* Surface soil and subsurface soil combined.

TABLE 4.7.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 28, IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Medium: Soil*
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name

(1) Professional Judgement, assumed 1/2 day.

(2) Professional Judgement based on maintenance activities that would occur 8 hrs per day.

(3) Professional Judgement assuming trespasser would spend a maximum of 2 hours at the site.

(4) Professional Judgement assuming 1 day per week for 26 weeks per year for the RME.

(5) Professional Judgement assuming adolescents from 9 to 18 years of age.

(6) Inhalation rate is based on values for the outdoor worker assuming moderate activity (EPA, 1997, page 5-24).

(7) Professional Judgement based on maintenance activities that would occur 4 hrs per day.

(8) Body weight is average of the mean values for boys and girls for the ages 9 through 18.

(9) Average of the mean recommended inhalation values Table 5-23, EPA, 1997.

(10) Assumed light activity level, short-term exposure for adult, Table 5-23, EPA, 1997.

(11) Assumed light activity level, short-term exposure for males/females ages 10 to 18, Table 5-14, EPA, 1997.

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1996: Soil Screening Guidance: User's Guide. OSWER. EPA/540/R-96/018.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

TABLE 4.8.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURE
Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Ingestion	Resident	Adult	Tap Water	CW	Chemical Concentration in Water	See Table ---	µg/l	See Table ---	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate of Water	1.4	liters/day	EPA, 1997 (2)	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 2001	
				ED	Exposure Duration	9	years	EPA, 1993	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
		Child	Tap Water	CW	Chemical Concentration in Water	See Table ---	µg/l	See Table ---	CDI (mg/kg-day) =
				IR-W	Ingestion Rate of Water	0.74	liters/day	EPA, 1997 (3)	CW x IR-W x EF x ED x CF1 x 1/BW x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	6	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW	Body Weight	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	EPA, 1989	
		Child/Adult	Tap Water	CW	Chemical Concentration in Water	See Table ---	µg/l	See Table ---	CDI (mg/kg-day) =
				IR-W-A	Ingestion Rate of Water, Adult	1.4	liters/day	EPA, 1993	CW x IR-W-Adj x EF x CF1 x 1/AT
				IR-W-C	Ingestion Rate of Water, Child	0.74	liters/day	EPA, 1997	
				IR-W-Adj	Ingestion Rate of Water, Age-adjusted	0.48	liter-year/kg-day	calculated	IR-W-Adj (liter-year/kd-day) =
				EF	Exposure Frequency	234	days/year	EPA, 1993	(ED-C x IR-W-C / BW-C) +
				ED-A	Exposure Duration, Adult	9	years	EPA, 1993	(ED-A x IR-W-A / BW-A)
				ED-C	Exposure Duration, Child	6	years	EPA, 1991	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				BW-A	Body Weight , Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	

TABLE 4.8.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURE
Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal	Resident	Adult	Tap Water	CW	Chemical Concentration in Water	See Table ---	µg/l	See Table ---	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2001	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2001	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2001	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2001	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2001	Organics :
				t_{event}	Event Time	0.25	hr/event	EPA, 2001	$t_{event}<t^*$: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	18,000	cm^2	EPA, 2001	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2001	x CF1 x CF2
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	9	years	EPA, 2001	$t_{event}>t^*$: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	--	
				CF2	Conversion Factor 2	0.001	l/cm^3	--	
		Child	Tap Water	CW	Chemical Concentration in Water	See Table ---	µg/l	See Table ---	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2001	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2001	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2001	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2001	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2001	Organics :
				t_{event}	Event Time	0.33	hr/event		$t_{event}<t^*$: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	6,600	cm^2	EPA, 2001	2 x FA x Kp x CW x (sqrt((6 x τ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2001	x CF1 x CF2
				EF	Exposure Frequency	234	days/year	EPA, 1993	
				ED	Exposure Duration	6	years	EPA, 2001	$t_{event}>t^*$: DAevent (mg/cm^2-event) =
				BW	Body Weight	15	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + $3B^2$)/$(1+B)^2$)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	2190	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	--	
				CF2	Conversion Factor 2	0.001	l/cm^3	--	

TABLE 4.8.CTE
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY EXPOSURE
Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Dermal (continued)	Resident	Child/Adult	Tap Water	CW	Chemical Concentration in Water	See Table ---	µg/l	See Table ---	CDI (mg/kg-day) = DA-Adj x EF x 1/AT
				DAevent-A	Dermally Absorbed Dose per Event, Adult	calculated	mg/cm^2-event	calculated	
				DAevent-C	Dermally Absorbed Dose per Event, Child	calculated	mg/cm^2-event	calculated	DA-Adj = (Daevent-A x SA-A x ED-A x 1/BW-A)
				DA-Adj	Dermally Absorbed Dose, Age-adjusted	calculated	mg-year/event-kg	calculated	+ (Daevent-C x SA-C x ED-C x 1/BW-C)
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2001	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2001	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2001	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2001	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2001	Organics :
				t_{event}-A	Event Time, Adult	0.25	hr/event	EPA, 2001	t_{event}<t*: DAevent (mg/cm^2-event) =
				t_{event}-C	Event Time, Child	0.33	hr/event	EPA, 2001	2 x FA x Kp x CW x (sqrt((6 xτ x t_{event})/π))
				SA-A	Skin Surface Area, Adult	18,000	cm^2	EPA, 2001	x CF1 x CF2
				SA-C	Skin Surface Area, Child	6,600	cm^2	EPA, 2001	
				EV	Event Frequency	1	events/day	EPA, 2001	t_{event}>t*: DAevent (mg/cm^2-event) =
				EF	Exposure Frequency	234	days/year	EPA, 1993	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				ED-A	Exposure Duration, Adult	9	years	EPA, 2001	((1 + 3B + 3B^2)/(1+B)^2)) x CF1 x CF2
				ED-C	Exposure Duration, Child	6	years	EPA, 2001	
				BW-A	Body Weight, Adult	70	kg	EPA, 1991	
				BW-C	Body Weight, Child	15	ke	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	
	Construction Worker	Adult	Water in Excavation Pit	CW	Chemical Concentration in Water	See Table ---	µg/l	See Table ---	CDI (mg/kg-day) =
				DAevent	Dermally Absorbed Dose per Event	calculated	mg/cm^2-event	calculated	DAevent x SA x EV x EF x ED x 1/BW x 1/AT
				FA	Fraction absorbed water	chemical specific	dimensionless	EPA, 2001	
				Kp	Permeability Coefficient	chemical specific	cm/hr	EPA, 2001	Inorganics: DAevent (mg/cm^2-event) =
				τ	Lag Time	chemical specific	hr/event	EPA, 2001	Kp x CW x t_{event} x CF1 x CF2
				t*	Time to Reach Steady-state	chemical specific	hours	EPA, 2001	
				B	Ratio of Permeability of Stratum Corneum to Epidermis	chemical specific	dimensionless	EPA, 2001	Organics :
				t_{event}	Event Time	4	hr/day	(1)	t_{event}<t*: DAevent (mg/cm^2-event) =
				SA	Skin Surface Area Available for Contact	3,300	cm^2	EPA, 2001 (4)	2 x FA x Kp x CW x (sqrt((6 xτ x t_{event})/π))
				EV	Event Frequency	1	events/day	EPA, 2001	x CF1 x CF2
				EF	Exposure Frequency	219	days/year	EPA, 1993	
				ED	Exposure Duration	1	years	EPA, 1991	t_{event}>t*: DAevent (mg/cm^2-event) =
				BW	Body Weight	70	kg	EPA, 1991	FA x Kp x CW x (t_{event}/(1+B) + 2 x τ x
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	((1 + 3B + 3B^2)/(1+B)^2)) x CF1 x CF2
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	
				CF1	Conversion Factor 1	0.001	mg/µg	- -	
				CF2	Conversion Factor 2	0.001	l/cm^3	- -	

TABLE 4.8.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 28, IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future

Medium: Groundwater

Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name

(1) Professional judgement assuming 1/2 RME value for CT.

(2) Mean value of recommended drinking water intake rates.

(3) Average mean of recommended drinking water intake rates for child 1 - 10 years old.

(4)EPA recommened value for adult worker (USEPA, 2001).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendency and Reasonable Maximum Exposure.

EPA, 1997: Exposure Factors Handbook. EPA/600/P-95/002Fa.

EPA, 2001: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. EPA/540/R/99/005.

TABLE 4.9.CTE

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY EXPOSURE

Site 28, IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name
Inhalation	Resident	Adult	Water Vapors at showerhead	CW	Chemical Concentration in Water	See Table ---	µg/l	See Table ---	Chronic Daily Intake (CDI) (mg/kg-day) =
				InhExp	Inhalation Exposure per Shower	calculated	mg/kg-shower		InhExp x EF x ED x 1/AT
				EF	Exposure Frequency	234	days/year	EPA, 1993	Foster & Chrostowski Shower Inhalation Model
				ED	Exposure Duration	9	years	EPA, 1993	for InhExp
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	EPA, 1989	
	Construction Worker	Adult	Water Vapors at Excavation Pit	CW	Chemical Concentration in Water	See Table ---	µg/l	See Table ---	Chronic Daily Intake (CDI) (mg/kg-day) =
				CA	Chemical Concentration in Air	calculated	mg/m^3		CA x IN x ET x EF x ED x 1/BW x 1/AT
				IN	Inhalation Rate	1.5	m3/hour	EPA, 1997 (2)	
				ET	Exposure Time	4	hr/day	(1)	CA calculated using two-film model
				EF	Exposure Frequency	219	days/year	EPA, 1993	
				ED	Exposure Duration	1	years	EPA, 1991	
				BW	Body Weight	70	kg	EPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	EPA, 1989	

Notes:

(1) Professional Judgement assuming 1/2 the RME value for the CT.

(2) Inhalation rate is based on values for the outdoor worker assuming moderate activity (EPA, 1997, page 5-24).

Sources:

EPA, 1989: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual, Part A. OERR. EPA/540/1-89/002.

EPA, 1991: Risk Assessment Guidance for Superfund. Vol.1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER Directive 9285.6-03.

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TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Site 28, IHDIV-NSWC

Indian Head, Maryland

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY)
Aluminum	Chronic	1.0E+00	mg/kg-day	NA	1.0E+00	mg/kg-day	CNS	100	NCEA	8/26/1996
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	Chronic	4.0E-04	mg/kg-day	15%	6.0E-05	mg/kg-day	Blood	1000	IRIS	10/28/2003
	Subchronic	4.0E-04	mg/kg-day	15%	6.0E-05	mg/kg-day	Blood	1000	HEAST	7/1/1997
Arsenic	Chronic	3.0E-04	mg/kg-day	95%	3.0E-04	mg/kg-day	Skin/vascular	3/1	IRIS	11/7/2003
	Subchronic	3.0E-04	mg/kg-day	95%	3.0E-04	mg/kg-day	Skin/vascular	3	HEAST	7/1/1997
Barium	Chronic	7.0E-02	mg/kg-day	7%	4.9E-03	mg/kg-day	NOAEL	3	IRIS	11/7/2003
	Subchronic	7.0E-02	mg/kg-day	7%	4.9E-03	mg/kg-day	Cardiovascular	3	HEAST	7/1/1997
Benzo(a)pyrene	Chronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	Chronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium (Food)	Chronic	1.0E-03	mg/kg-day	2.5%	2.5E-05	mg/kg-day	Kidney	10	IRIS	11/7/2003
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium (Water)	Chronic	5.0E-04	mg/kg-day	5%	2.5E-05	mg/kg-day	Kidney	10	IRIS	11/7/2003
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Tetrachloride	Chronic	7.0E-04	mg/kg-day	NA	7.0E-04	mg/kg-day	Liver	1000	IRIS	11/16/2003
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (hexavalent)	Chronic	3.0E-03	mg/kg-day	2.5%	7.5E-05	mg/kg-day	NOAEL	300/3	IRIS	11/7/2003
	Subchronic	2.0E-02	mg/kg-day	2.5%	5.0E-04	mg/kg-day	NOAEL	100	HEAST	7/1/1997
Cobalt	Chronic	2.0E-02	mg/kg-day	NA	2.0E-02	mg/kg-day	Sensitizer	N/A	NCEA	11/18/1991
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	Chronic	4.0E-02	mg/kg-day	NA	4.0E-02	mg/kg-day	Gastrointestinal	NA	HEAST	7/1/1997
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	7/1/1997
Dibenzo(a,h)anthracene	Chronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	Chronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	Chronic	3.0E-01	mg/kg-day	NA	3.0E-01	mg/kg-day	Gastrointestinal	1	NCEA	7/23/1996
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	Chronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

Site 28, IHDIV-NSWC

Indian Head, Maryland

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD (2)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfD: Target Organ	Dates of RfD: Target Organ (MM/DD/YY)
Manganese (nonfood)	Chronic	2.0E-02	mg/kg-day	4%	8.0E-04	mg/kg-day	CNS	1	IRIS	11/7/2003
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese (food)	Chronic	1.4E-01	mg/kg-day	4%	5.6E-03	mg/kg-day	CNS	1/1	IRIS	11/7/2003
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury (Inorganic)	Chronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercuric chloride	Chronic	3.0E-04	mg/kg-day	7%	2.1E-05	mg/kg-day	Immune System	1000/1	IRIS	11/7/2003
	Subchronic	3.0E-04	mg/kg-day	7%	2.1E-05	mg/kg-day	Kidney	1000	HEAST	7/1/1997
Nickel	Chronic	2.0E-02	mg/kg-day	4%	8.0E-04	mg/kg-day	Whole Body	300/1	IRIS	11/7/2003
	Subchronic	2.0E-02	mg/kg-day	4%	8.0E-04	mg/kg-day	Whole Body	300	HEAST	7/1/1997
n-Nitroso-di-n-propylamine	Chronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	Chronic	7.0E-05	mg/kg-day	100%	7.0E-05	mg/kg-day	Liver, Blood, Hair	3/1	EPA III	10/15/2003
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	Chronic	1.0E-03	mg/kg-day	2.6%	2.6E-05	mg/kg-day	Kidney	100	NCEA	5/1/2000
	Subchronic	N/A								
Zinc	Chronic	3.0E-01	mg/kg-day	NA	3.0E-01	mg/kg-day	Blood	3/1	IRIS	11/7/2003
	Subchronic	3.0E-01	mg/kg-day	NA	3.0E-01	mg/kg-day	Blood	3/1	HEAST	7/1/1997

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evalution Manual (Part E, Supplemetnal Guidance for Dermal Risk Assessment (Interim). Section 4.2 and Exhibit 4-1. USEPA recommends that the oral RfD should not be adjusted to estimate the absorbed dose for compounds when the absorption efficiency is greater than 50%. Constituents that do not have oral absorption efficiencies reported on this table were assumed to have an oral absorption efficiency of 100%.

(2) See Risk Assessment text for the derivation of the "Absorbed RfD for Dermal"

Definitions:

NA = Not Available

IRIS = Integrated Risk Information System

HEAST = Health Effects Assessment Summary Tables

NCEA = National Center for Environmental Assessment

EPA III = USEPA Region III RBC TAble

CNS = Central Nervous System

NOAEL = No Observed Adverse Effects Level

TABLE 5-2

NON-CANCER TOXICITY DATA -- INHALATION

Site 28, IHDIV-NSWC

Indian Head, Maryland

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ	Dates (MM/DD/YY)
Aluminum	Chronic	3.50E-03	mg/m^3	1.00E-03	mg/kg-day	CNS	300	NCEA	9/25/2001
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Barium	Chronic	5.00E-04	mg/m^3	1.40E-04	mg/kg-day	Fetotoxicity	1000	HEAST	7/1/1997
	Subchronic	5.00E-03	mg/m^3	1.40E-03	mg/kg-day	Fetotoxicity	100	HEAST	7/1/1997
Benzo(a)pyrene	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	Chronic	2.00E-04	mg/m^3	5.70E-05	mg/kg-day	Kidney	10	NCEA	
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Carbon Tetrachloride	Chronic	2.00E-03	mg/m^3	5.71E-04	mg/kg-day	Liver		NCEA	
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Chromium (hexavalent)	Chronic	1.05E-04	mg/m^3	3.00E-05	mg/kg-day	Respiratory System	90/1	IRIS	11/7/2003
	Subchronic	1.05E-03	mg/m^3	3.00E-04	mg/kg-day	NOAEL	100	NCEA	11/18/1997
Cobalt	Chronic	2.00E-05	mg/m^3	5.70E-06	mg/kg-day	Sensitizer	N/A	NCEA	5/24/2001
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Copper	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Iron	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Lead	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	Chronic	5.01E-05	mg/m^3	1.43E-05	mg/kg-day	CNS	1000/1	IRIS	11/7/2003
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Mercury (inorganic)	Chronic	3.0E-04	mg/m3	8.6E-05	mg/kg-day	CNS	30	IRIS	11/7/2003
	Subchronic	3.0E-04	mg/m3	8.6E-05	mg/kg-day	CNS	30	HEAST	7/1/1997

TABLE 5-2

NON-CANCER TOXICITY DATA -- INHALATION

Site 28, IHDIV-NSWC

Indian Head, Maryland

Chemical of Potential Concern	Chronic/ Subchronic	Value Inhalation RfC	Units	Adjusted Inhalation RfD (1)	Units	Primary Target Organ	Combined Uncertainty/Modifying Factors	Sources of RfC:RfD: Target Organ	Dates (MM/DD/YY)
Mercuric chloride	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-propylamine	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	Chronic	N/A	NA	NA	NA	NA	NA	NA	NA
	Subchronic	N/A	NA	NA	NA	NA	NA	NA	NA
Vanadium	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	Chronic	NA	NA	NA	NA	NA	NA	NA	NA
	Subchronic	NA	NA	NA	NA	NA	NA	NA	NA

(1) See Risk Assessment text for the derivation of the "Extrapolated RfD".

Definitions:

NA = Not Available

IRIS = Integrated Risk Information System

NCEA = National Center for Environmental Assessment

CNS = Central Nervous System

ATSDR = Agency for Toxic Substances and Disease Registry

HEAST = Health Effects Assessment Summary Tables

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

Site 28, IHDIV-NSWC

Indian Head, Maryland

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor	Adjusted Dermal Cancer Slope Factor (1)	Units	EPA Carcinogen Group	Source	Date (2) (MM/DD/YY)
Aluminum	NA	NA	NA	NA	NA	NCEA	8/26/1996
Antimony	NA	NA	NA	NA	NA	IRIS	11/7/2003
Arsenic	1.5E+00	95%	1.5E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	11/7/2003
Barium	NA	NA	NA	NA	NA	IRIS	11/7/2003
Benzo(a)pyrene	7.3E+00	58% - 89%	7.3E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	11/7/2003
Benzo(b)fluoranthene	7.3E-01	58% - 89%	7.3E-01	$(mg/kg\text{-}day)^{-1}$	B2	NCEA	7/1/1993
Cadmium	NA	NA	NA	NA	B1	IRIS	11/7/2003
Carbon Tetrachloride	1.3E-01	NA	1.3E-01	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	11/16/2003
Chromium (hexavalent)	NA	NA	NA	NA	D	IRIS	11/7/2003
Cobalt	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	D	HEAST	7/1/1997
Dibenz(a,h)anthracene	7.3E+00	58% - 89%	7.3E+00	$(mg/kg\text{-}day)^{-1}$	B2	NCEA	7/1/1993
Indeno(1,2,3-cd)pyrene	7.3E-01	58% - 89%	7.3E-01	$(mg/kg\text{-}day)^{-1}$	B2	NCEA	7/1/1993
Iron	NA	NA	NA	NA	NA	NCEA	7/23/1996
Lead	NA	NA	NA	NA	NA	NA	NA
Manganese (nonfood)	NA	NA	NA	NA	D	IRIS	11/7/2003
Mercury (Inorganic)	NA	NA	NA	NA	NA	NA	NA
Mercuric chloride	NA	NA	NA	NA	C	NA	NA
Nickel	NA	NA	NA	NA	D	IRIS	11/7/2003
n-Nitroso-di-n-propylamine	7.0E+00	NA	7.0E+00	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	11/7/2003
Thallium	NA	NA	NA	NA	NA	RBC	10/15/2003
Vanadium	NA	NA	NA	NA	NA	HEAST	7/1/1997
Zinc	NA	NA	NA	NA	D	IRIS	11/7/2003

(1) Source: Risk Assessment Guidance for Superfund. Volume 1: Human Health Evalution Manual (Part E, Supplemetnal Guidance for Dermal Risk Assessment (Interim). Section 4.2 and Exhibit 4-1. USEPA recommends that the oral CSF should not be adjusted to estimate the absorbed dose for compounds when the absorption efficiency is greater than 50%. Constituents that do not have oral absorption efficiencies reported on this table were assumed to have an oral absorption efficiency of 100%.

NA = Not Available

IRIS = Integrated Risk Information System

NCEA = National Center for Environmental Assessment

HEAST= Health Effects Assessment Summary Tables

RBC = Risk Based Concentration Table

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

Site 28, IHDIV-NSWC

Indian Head, Maryland

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor	Adjusted Dermal Cancer Slope Factor (1)	Units	EPA Carcinogen Group	Source	Date (2) (MM/DD/YY)

Weight of Evidence definitions:

Group A chemicals (known human carcinogens) are agents for which there is sufficient evidence to support the causal association between exposure to the agents in humans and cancer.

Group B1 chemicals (probable human carcinogens) are agents for which there is limited evidence of possible carcinogenicity in humans.

Group B2 chemicals (probable human carcinogens) are agents for which there is sufficient evidence of carcinogenicity in animals but inadequate or a lack of evidence in humans.

Group C chemicals (possible human carcinogens) are agents for which there is limited evidence of carcinogenicity in animals and inadequate or a lack of human data.

Group D chemicals (not classifiable as to human carcinogenicity) are agents with inadequate human and animal evidence of carcinogenicity or for which no data are available.

Group E chemicals (evidence of noncarcinogenicity in humans) are agents for which there is no evidence of carcinogenicity from human or animal studies, or both.

TABLE 6.2

CANCER TOXICITY DATA -- INHALATION

Site 28, IHDIV-NSWC

Indian Head, Maryland

Chemical of Potential Concern	Unit Risk	Units	Adjustment (1)	Inhalation Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guidance Description	Source	Date (2) (MM/DD/YY)
Aluminum	NA	NA	NA	NA	NA	NA	NA	NA
Antimony	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	4.0E-03	$(ug/m3)^{-1}$	3500	1.5E+01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	11/7/2003
Barium	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	8.9E-04	$(ug/m3)^{-1}$	3500	3.1E+00	$(mg/kg\text{-}day)^{-1}$	B2	HEAST	7/1/1997
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	1.8E-03	$(ug/m3)^{-1}$	3500	6.3E+00	$(mg/kg\text{-}day)^{-1}$	B1	IRIS	11/7/2003
Carbon Tetrachloride	1.5E-05	$(ug/m3)^{-1}$	3500	5.3E-02	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	11/6/2003
Chromium	1.2E-02	$(ug/m3)^{-1}$	3500	4.1E+01	$(mg/kg\text{-}day)^{-1}$	A	HEAST	7/1/1997
Cobalt	2.8E-03	$(ug/m3)^{-1}$	3500	9.8E+00	$(mg/kg\text{-}day)^{-1}$		NCEA	
Copper	NA	NA	NA	NA	NA	NA	NA	NA
Dibenz(a,h)anthracene	NA	NA	NA	NA	NA	NA	NA	NA
Iron	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	NA	NA	NA	NA	NA	NA	NA
Mercuric chloride	N/A	NA	NA	NA	NA	NA	NA	NA
Mercury	N/A	NA	NA	NA	NA	NA	NA	NA
n-Nitroso-di-n-propylamine	N/A	NA	NA	NA	NA	NA	NA	NA
Thallium	N/A	NA	NA	NA	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA

Definitions: NA = Not Available

IRIS = Integrated Risk Information System

NCEA = National Center for Environmental Assessment

Weight of Evidence definitions:

Group A chemicals (known human carcinogens) are agents for which there is sufficient evidence to support the causal association between exposure to the agents in humans and cancer.

Group B1 chemicals (probable human carcinogens) are agents for which there is limited evidence of possible carcinogenicity in humans.

Group B2 chemicals (probable human carcinogens) are agents for which there is sufficient evidence of carcinogenicity in animals but inadequate or a lack of evidence in humans.

Group C chemicals (possible human carcinogens) are agents for which there is limited evidence of carcinogenicity in animals and inadequate or a lack of human data.

Group D chemicals (not classifiable as to human carcinogenicity) are agents with inadequate human and animal evidence of carcinogenicity or for which no data are available.

Group E chemicals (evidence of noncarcinogenicity in humans) are agents for which there is no evidence of carcinogenicity from human or animal studies, or both.

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Current
Receptor Population: Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Site 28 Soil*	Ingestion	Benzo(a)pyrene	2.9E-01	mg/kg	2.0E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.4E-07	5.5E-08	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	3.5E-01	mg/kg	2.4E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.7E-08	6.6E-08	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.0E-01	mg/kg	2.0E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.5E-07	5.7E-08	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.2E-01	mg/kg	2.1E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.6E-08	6.0E-08	mg/kg/day	NA	NA	NA
				n-Nitroso-di-n-propylamine	1.0E-01	mg/kg	6.7E-09	mg/kg/day	7.0E+00	1/(mg/kg-day)	4.7E-08	1.9E-08	mg/kg/day	NA	NA	NA
				Aluminum	6.6E+03	mg/kg	4.4E-04	mg/kg/day	NA	NA	NA	1.2E-03	mg/kg/day	1.0E+00	mg/kg/day	1.2E-03
				Antimony	2.6E+01	mg/kg	1.7E-06	mg/kg/day	NA	NA	NA	4.8E-06	mg/kg/day	4.0E-04	mg/kg/day	1.2E-02
				Arsenic	1.2E+02	mg/kg	8.3E-06	mg/kg/day	1.5E+00	1/(mg/kg-day)	1.2E-05	2.3E-05	mg/kg/day	3.0E-04	mg/kg/day	7.8E-02
				Barium	4.0E+02	mg/kg	2.7E-05	mg/kg/day	NA	NA	NA	7.4E-05	mg/kg/day	7.0E-02	mg/kg/day	1.1E-03
				Cadmium	4.4E+01	mg/kg	3.0E-06	mg/kg/day	NA	NA	NA	8.3E-06	mg/kg/day	1.0E-03	mg/kg/day	8.3E-03
				Chromium	3.2E+01	mg/kg	2.2E-06	mg/kg/day	NA	NA	NA	6.0E-06	mg/kg/day	3.0E-03	mg/kg/day	2.0E-03
				Copper	3.4E+02	mg/kg	2.3E-05	mg/kg/day	NA	NA	NA	6.5E-05	mg/kg/day	4.0E-02	mg/kg/day	1.6E-03
				Iron	2.2E+04	mg/kg	1.5E-03	mg/kg/day	NA	NA	NA	4.2E-03	mg/kg/day	3.0E-01	mg/kg/day	1.4E-02
				Manganese	2.3E+02	mg/kg	1.6E-05	mg/kg/day	NA	NA	NA	4.4E-05	mg/kg/day	2.0E-02	mg/kg/day	2.2E-03
				Mercury	1.3E+00	mg/kg	8.9E-08	mg/kg/day	NA	NA	NA	2.5E-07	mg/kg/day	3.0E-04	mg/kg/day	8.3E-04
				Nickel	1.4E+01	mg/kg	9.2E-07	mg/kg/day	NA	NA	NA	2.6E-06	mg/kg/day	2.0E-02	mg/kg/day	1.3E-04
				Thallium	4.7E-01	mg/kg	3.1E-08	mg/kg/day	NA	NA	NA	8.8E-08	mg/kg/day	7.0E-05	mg/kg/day	1.3E-03
				Vanadium	2.7E+01	mg/kg	1.8E-06	mg/kg/day	NA	NA	NA	5.0E-06	mg/kg/day	1.0E-03	mg/kg/day	5.0E-03
				Zinc	2.4E+04	mg/kg	1.6E-03	mg/kg/day	NA	NA	NA	4.6E-03	mg/kg/day	3.0E-01	mg/kg/day	1.5E-02
			Exp. Route Total								1.3E-05					1.4E-01
			Dermal Absorption	Benzo(a)pyrene	2.9E-01	mg/kg	5.3E-09	mg/kg/day	7.3E+00	1/(mg/kg-day)	3.9E-08	1.5E-08	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	3.5E-01	mg/kg	6.4E-09	mg/kg/day	7.3E-01	1/(mg/kg-day)	4.6E-09	1.8E-08	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.0E-01	mg/kg	5.4E-09	mg/kg/day	7.3E+00	1/(mg/kg-day)	4.0E-08	1.5E-08	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.2E-01	mg/kg	5.7E-09	mg/kg/day	7.3E-01	1/(mg/kg-day)	4.2E-09	1.6E-08	mg/kg/day	NA	NA	NA
				n-Nitroso-di-n-propylamine	1.0E-01	mg/kg	1.4E-09	mg/kg/day	7.0E+00	1/(mg/kg-day)	9.7E-09	3.9E-09	mg/kg/day	NA	NA	NA
				Aluminum	6.6E+03	mg/kg	9.1E-06	mg/kg/day	NA	NA	NA	2.5E-05	mg/kg/day	1.0E+00	mg/kg/day	2.5E-05
				Antimony	2.6E+01	mg/kg	3.5E-08	mg/kg/day	NA	NA	NA	9.9E-08	mg/kg/day	6.0E-05	mg/kg/day	1.7E-03
				Arsenic	1.2E+02	mg/kg	5.1E-07	mg/kg/day	1.5E+00	1/(mg/kg-day)	7.7E-07	1.4E-06	mg/kg/day	3.0E-04	mg/kg/day	4.8E-03
				Barium	4.0E+02	mg/kg	5.5E-07	mg/kg/day	NA	NA	NA	1.5E-06	mg/kg/day	4.9E-03	mg/kg/day	3.1E-04
				Cadmium	4.4E+01	mg/kg	6.1E-09	mg/kg/day	NA	NA	NA	1.7E-08	mg/kg/day	2.5E-05	mg/kg/day	6.9E-04
				Chromium	3.2E+01	mg/kg	4.4E-08	mg/kg/day	NA	NA	NA	1.2E-07	mg/kg/day	7.5E-05	mg/kg/day	1.7E-03
				Copper	3.4E+02	mg/kg	4.8E-07	mg/kg/day	NA	NA	NA	1.3E-06	mg/kg/day	4.0E-02	mg/kg/day	3.3E-05

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Current
Receptor Population: Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Site 28 Soil*	Dermal Absorption	Iron	2.2E+04	mg/kg	3.1E-05	mg/kg/day	NA	NA	NA	8.7E-05	mg/kg/day	3.0E-01	mg/kg/day	2.9E-04
				Manganese	2.3E+02	mg/kg	3.2E-07	mg/kg/day	NA	NA	NA	9.1E-07	mg/kg/day	8.0E-04	mg/kg/day	1.1E-03
				Mercury	1.3E+00	mg/kg	1.8E-09	mg/kg/day	NA	NA	NA	5.2E-09	mg/kg/day	2.1E-05	mg/kg/day	2.5E-04
				Nickel	1.4E+01	mg/kg	1.9E-08	mg/kg/day	NA	NA	NA	5.3E-08	mg/kg/day	8.0E-04	mg/kg/day	6.7E-05
				Thallium	4.7E-01	mg/kg	6.5E-10	mg/kg/day	NA	NA	NA	1.8E-09	mg/kg/day	7.0E-05	mg/kg/day	2.6E-05
				Vanadium	2.7E+01	mg/kg	3.7E-08	mg/kg/day	NA	NA	NA	1.0E-07	mg/kg/day	2.6E-05	mg/kg/day	4.0E-03
				Zinc	2.4E+04	mg/kg	3.4E-05	mg/kg/day	NA	NA	NA	9.5E-05	mg/kg/day	3.0E-01	mg/kg/day	3.2E-04
			Exp. Route Total								8.7E-07					1.5E-02
		Exposure Point Total									1.4E-05					1.6E-01
	Exposure Medium Total										1.4E-05					1.6E-01
Soil* Total											1.4E-05					1.6E-01
											Total of Receptor Risks Across All Media	1.4E-05		Total of Receptor Hazards Across All Media		1.6E-01

* Surface and subsurface soil combined.

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Current
Receptor Population: Trespasser
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 28 Surface Soil	Ingestion	Benzo(a)pyrene	3.7E-01	mg/kg	2.6E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.9E-07	7.5E-08	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	4.7E-01	mg/kg	3.3E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	2.4E-08	9.6E-08	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.9E-01	mg/kg	2.7E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	2.0E-07	7.8E-08	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	4.1E-01	mg/kg	2.9E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	2.1E-08	8.4E-08	mg/kg/day	NA	NA	NA
				n-Nitroso-di-n-propylamine	4.4E-01	mg/kg	3.1E-08	mg/kg/day	7.0E+00	1/(mg/kg-day)	2.2E-07	9.0E-08	mg/kg/day	NA	NA	NA
				Aluminum	6.5E+03	mg/kg	4.6E-04	mg/kg/day	NA	NA	NA	1.3E-03	mg/kg/day	1.0E+00	mg/kg/day	1.3E-03
				Antimony	7.7E+00	mg/kg	5.3E-07	mg/kg/day	NA	NA	NA	1.6E-06	mg/kg/day	4.0E-04	mg/kg/day	3.9E-03
				Arsenic	1.5E+02	mg/kg	1.1E-05	mg/kg/day	1.5E+00	1/(mg/kg-day)	1.6E-05	3.1E-05	mg/kg/day	3.0E-04	mg/kg/day	1.0E-01
				Barium	4.7E+02	mg/kg	3.3E-05	mg/kg/day	NA	NA	NA	9.6E-05	mg/kg/day	7.0E-02	mg/kg/day	1.4E-03
				Cadmium	6.1E+01	mg/kg	4.2E-06	mg/kg/day	NA	NA	NA	1.2E-05	mg/kg/day	1.0E-03	mg/kg/day	1.2E-02
				Chromium	4.2E+01	mg/kg	2.9E-06	mg/kg/day	NA	NA	NA	8.5E-06	mg/kg/day	3.0E-03	mg/kg/day	2.8E-03
				Copper	3.9E+02	mg/kg	2.7E-05	mg/kg/day	NA	NA	NA	8.0E-05	mg/kg/day	4.0E-02	mg/kg/day	2.0E-03
				Iron	2.5E+04	mg/kg	1.7E-03	mg/kg/day	NA	NA	NA	5.0E-03	mg/kg/day	3.0E-01	mg/kg/day	1.7E-02
				Manganese	3.4E+02	mg/kg	2.4E-05	mg/kg/day	NA	NA	NA	7.0E-05	mg/kg/day	2.0E-02	mg/kg/day	3.5E-03
				Mercury	2.6E+00	mg/kg	1.8E-07	mg/kg/day	NA	NA	NA	5.3E-07	mg/kg/day	3.0E-04	mg/kg/day	1.8E-03
				Vanadium	3.4E+01	mg/kg	2.4E-06	mg/kg/day	NA	NA	NA	6.9E-06	mg/kg/day	1.0E-03	mg/kg/day	6.9E-03
				Zinc	4.0E+04	mg/kg	2.8E-03	mg/kg/day	NA	NA	NA	8.0E-03	mg/kg/day	3.0E-01	mg/kg/day	2.7E-02
			Exp. Route Total								1.7E-05					1.8E-01
			Dermal	Benzo(a)pyrene	3.7E-01	mg/kg	5.7E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	4.2E-07	1.7E-07	mg/kg/day	NA	NA	NA
			Absorption	Benzo(b)fluoranthene	4.7E-01	mg/kg	7.3E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	5.4E-08	2.1E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.9E-01	mg/kg	6.0E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	4.4E-07	1.7E-07	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	4.1E-01	mg/kg	6.4E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	4.7E-08	1.9E-07	mg/kg/day	NA	NA	NA
				n-Nitroso-di-n-propylamine	4.4E-01	mg/kg	5.3E-08	mg/kg/day	7.0E+00	1/(mg/kg-day)	3.7E-07	1.5E-07	mg/kg/day	NA	NA	NA
				Aluminum	6.5E+03	mg/kg	7.8E-05	mg/kg/day	NA	NA	NA	2.3E-04	mg/kg/day	1.0E+00	mg/kg/day	2.3E-04
				Antimony	7.7E+00	mg/kg	9.1E-08	mg/kg/day	NA	NA	NA	2.7E-07	mg/kg/day	6.0E-05	mg/kg/day	4.4E-03
				Arsenic	1.5E+02	mg/kg	5.5E-06	mg/kg/day	1.5E+00	1/(mg/kg-day)	8.2E-06	1.6E-05	mg/kg/day	3.0E-04	mg/kg/day	5.3E-02
				Barium	4.7E+02	mg/kg	5.6E-06	mg/kg/day	NA	NA	NA	1.6E-05	mg/kg/day	4.9E-03	mg/kg/day	3.3E-03
				Cadmium	6.1E+01	mg/kg	7.2E-08	mg/kg/day	NA	NA	NA	2.1E-07	mg/kg/day	2.5E-05	mg/kg/day	8.4E-03
				Chromium	4.2E+01	mg/kg	5.0E-07	mg/kg/day	NA	NA	NA	1.4E-06	mg/kg/day	7.5E-05	mg/kg/day	1.9E-02
				Copper	3.9E+02	mg/kg	4.7E-06	mg/kg/day	NA	NA	NA	1.4E-05	mg/kg/day	4.0E-02	mg/kg/day	3.4E-04

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Current
Receptor Population: Trespasser
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 28 Surface Soil	Dermal Absorption	Iron	2.5E+04	mg/kg	2.9E-04	mg/kg/day	NA	NA	NA	8.6E-04	mg/kg/day	3.0E-01	mg/kg/day	2.9E-03
				Manganese	3.4E+02	mg/kg	4.1E-06	mg/kg/day	NA	NA	NA	1.2E-05	mg/kg/day	8.0E-04	mg/kg/day	1.5E-02
				Mercury	2.6E+00	mg/kg	3.1E-08	mg/kg/day	NA	NA	NA	9.0E-08	mg/kg/day	2.1E-05	mg/kg/day	4.3E-03
				Vanadium	3.4E+01	mg/kg	4.1E-07	mg/kg/day	NA	NA	NA	1.2E-06	mg/kg/day	2.6E-05	mg/kg/day	4.6E-02
				Zinc	4.0E+04	mg/kg	4.7E-04	mg/kg/day	NA	NA	NA	1.4E-03	mg/kg/day	3.0E-01	mg/kg/day	4.6E-03
			Exp. Route Total								9.5E-06					1.6E-01
		Exposure Point Total									2.6E-05					3.4E-01
	Exposure Medium Total										2.6E-05					3.4E-01
Surface Soil Total											2.6E-05					3.4E-01
Total of Receptor Risks Across All Media											2.6E-05	Total of Receptor Hazards Across All Media				3.4E-01

TABLE 7.3.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 28 Surface Soil	Ingestion	Benzo(a)pyrene	3.7E-01	mg/kg	1.3E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	9.6E-08	1.0E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	4.7E-01	mg/kg	1.7E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.2E-08	1.3E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.9E-01	mg/kg	1.4E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.0E-07	1.1E-07	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	4.1E-01	mg/kg	1.5E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.1E-08	1.2E-07	mg/kg/day	NA	NA	NA
				n-Nitroso-di-n-propylamine	4.4E-01	mg/kg	1.6E-08	mg/kg/day	7.0E+00	1/(mg/kg-day)	1.1E-07	1.2E-07	mg/kg/day	NA	NA	NA
				Aluminum	6.5E+03	mg/kg	2.3E-04	mg/kg/day	NA	NA	NA	1.8E-03	mg/kg/day	1.0E+00	mg/kg/day	1.8E-03
				Antimony	7.7E+00	mg/kg	2.8E-07	mg/kg/day	NA	NA	NA	2.1E-06	mg/kg/day	4.0E-04	mg/kg/day	5.3E-03
				Arsenic	1.5E+02	mg/kg	5.5E-06	mg/kg/day	1.5E+00	1/(mg/kg-day)	8.2E-06	4.3E-05	mg/kg/day	3.0E-04	mg/kg/day	1.4E-01
				Barium	4.7E+02	mg/kg	1.7E-05	mg/kg/day	NA	NA	NA	1.3E-04	mg/kg/day	7.0E-02	mg/kg/day	1.9E-03
				Cadmium	6.1E+01	mg/kg	2.2E-06	mg/kg/day	NA	NA	NA	1.7E-05	mg/kg/day	1.0E-03	mg/kg/day	1.7E-02
				Chromium	4.2E+01	mg/kg	1.5E-06	mg/kg/day	NA	NA	NA	1.2E-05	mg/kg/day	3.0E-03	mg/kg/day	3.9E-03
				Copper	3.9E+02	mg/kg	1.4E-05	mg/kg/day	NA	NA	NA	1.1E-04	mg/kg/day	4.0E-02	mg/kg/day	2.7E-03
				Iron	2.5E+04	mg/kg	8.9E-04	mg/kg/day	NA	NA	NA	6.9E-03	mg/kg/day	3.0E-01	mg/kg/day	2.3E-02
				Manganese	3.4E+02	mg/kg	1.2E-05	mg/kg/day	NA	NA	NA	9.6E-05	mg/kg/day	2.0E-02	mg/kg/day	4.8E-03
				Mercury	2.6E+00	mg/kg	9.3E-08	mg/kg/day	NA	NA	NA	7.2E-07	mg/kg/day	3.0E-04	mg/kg/day	2.4E-03
				Vanadium	3.4E+01	mg/kg	1.2E-06	mg/kg/day	NA	NA	NA	9.5E-06	mg/kg/day	1.0E-03	mg/kg/day	9.5E-03
				Zinc	4.0E+04	mg/kg	1.4E-03	mg/kg/day	NA	NA	NA	1.1E-02	mg/kg/day	3.0E-01	mg/kg/day	3.7E-02
			Exp. Route Total								8.6E-06					2.5E-01
			Dermal Absorption	Benzo(a)pyrene	3.7E-01	mg/kg	2.3E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.7E-07	1.8E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	4.7E-01	mg/kg	2.9E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	2.1E-08	2.3E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.9E-01	mg/kg	2.4E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.7E-07	1.8E-07	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	4.1E-01	mg/kg	2.5E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.9E-08	2.0E-07	mg/kg/day	NA	NA	NA
				n-Nitroso-di-n-propylamine	4.4E-01	mg/kg	2.1E-08	mg/kg/day	7.0E+00	1/(mg/kg-day)	1.5E-07	1.6E-07	mg/kg/day	NA	NA	NA
				Aluminum	6.5E+03	mg/kg	3.1E-05	mg/kg/day	NA	NA	NA	2.4E-04	mg/kg/day	1.0E+00	mg/kg/day	2.4E-04
				Antimony	7.7E+00	mg/kg	3.6E-08	mg/kg/day	NA	NA	NA	2.8E-07	mg/kg/day	6.0E-05	mg/kg/day	4.7E-03
				Arsenic	1.5E+02	mg/kg	2.2E-06	mg/kg/day	1.5E+00	1/(mg/kg-day)	3.3E-06	1.7E-05	mg/kg/day	3.0E-04	mg/kg/day	5.6E-02
				Barium	4.7E+02	mg/kg	2.2E-06	mg/kg/day	NA	NA	NA	1.7E-05	mg/kg/day	4.9E-03	mg/kg/day	3.5E-03
				Cadmium	6.1E+01	mg/kg	2.9E-08	mg/kg/day	NA	NA	NA	2.2E-07	mg/kg/day	2.5E-05	mg/kg/day	8.9E-03
				Chromium	4.2E+01	mg/kg	2.0E-07	mg/kg/day	NA	NA	NA	1.5E-06	mg/kg/day	7.5E-05	mg/kg/day	2.0E-02
				Copper	3.9E+02	mg/kg	1.9E-06	mg/kg/day	NA	NA	NA	1.4E-05	mg/kg/day	4.0E-02	mg/kg/day	3.6E-04

TABLE 7.3.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Current
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Soil	Surface Soil	Site 28 Surface Soil	Dermal Absorption	Iron	2.5E+04	mg/kg	1.2E-04	mg/kg/day	NA	NA	NA	9.1E-04	mg/kg/day	3.0E-01	mg/kg/day	3.0E-03
				Manganese	3.4E+02	mg/kg	1.6E-06	mg/kg/day	NA	NA	NA	1.3E-05	mg/kg/day	8.0E-04	mg/kg/day	1.6E-02
				Mercury	2.6E+00	mg/kg	1.2E-08	mg/kg/day	NA	NA	NA	9.6E-08	mg/kg/day	2.1E-05	mg/kg/day	4.5E-03
				Vanadium	3.4E+01	mg/kg	1.6E-07	mg/kg/day	NA	NA	NA	1.3E-06	mg/kg/day	2.6E-05	mg/kg/day	4.8E-02
				Zinc	4.0E+04	mg/kg	1.9E-04	mg/kg/day	NA	NA	NA	1.5E-03	mg/kg/day	3.0E-01	mg/kg/day	4.9E-03
			Exp. Route Total								3.8E-06					1.7E-01
		Exposure Point Total									1.2E-05					4.2E-01
	Exposure Medium Total										1.2E-05					4.2E-01
Surface Soil Total											1.2E-05					4.2E-01
Total of Receptor Risks Across All Media											1.2E-05	Total of Receptor Hazards Across All Media				4.2E-01

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Current/Future
Receptor Population: Recreation
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Mattawoman Creek	Ingestion	Arsenic	3.8E+00	ug/L	1.7E-07	mg/kg/day	1.5E+00	1/(mg/kg-day)	2.6E-07	5.0E-07	mg/kg/day	3.0E-04	mg/kg/day	1.7E-03
			Exp. Route Total								2.6E-07					1.7E-03
			Dermal Absorption	Arsenic	3.8E+00	ug/L	2.2E-08	mg/kg/day	1.5E+00	1/(mg/kg-day)	3.2E-08	6.3E-08	mg/kg/day	3.0E-04	mg/kg/day	2.1E-04
			Exp. Route Total								3.2E-08					2.1E-04
		Exposure Point Total									2.9E-07					1.9E-03
	Exposure Medium Total										2.9E-07					1.9E-03
Surface Water Total											2.9E-07					1.9E-03
Total of Receptor Risks Across All Media											2.9E-07	Total of Receptor Hazards Across All Media				1.9E-03

Table 7.4.RME Supplement
Calculation of DAevent
Recreation Adult/Adolescent, Surface Water
Site 28 IHDIV-NSWC
Indian Head, Maryland

Chemical of Potential Concern	Surface Water Concentration (CW) (µg/L)	Permeability Coefficient (Kp) (cm/hr)	B dimensionles	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
Arsenic	3.80E+00	1.0E-03	NA	NA	NA	NA	2.6	9.9E-09	1

Inorganics: DAevent (mg/cm2-event) =

Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =

$$\text{If } t_{event} \le t^*, \text{then } DA_{event} = 2 \times FA \times K_p \times C_w \sqrt{\frac{6 \times \tau_{event} \times t_{event}}{\pi}} \qquad \text{(eq 2)}$$

(eq 2)

$$\text{If } t_{event} \ge t^*, \text{then } DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2 \times \tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right] \qquad \text{(eq 3)}$$

Notes:

Permeability constants from EPA 2001, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Interim).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.

NA - not applicable.

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Current/Future
Receptor Population: Recreation
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Mattawoman Creek	Ingestion	Arsenic	3.8E+00	ug/L	8.9E-08	mg/kg/day	1.5E+00	1/(mg/kg-day)	1.3E-07	6.9E-07	mg/kg/day	3.0E-04	mg/kg/day	2.3E-03
			Exp. Route Total								1.3E-07					2.3E-03
			Dermal Absorption	Arsenic	3.8E+00	ug/L	9.3E-09	mg/kg/day	1.5E+00	1/(mg/kg-day)	1.4E-08	7.3E-08	mg/kg/day	3.0E-04	mg/kg/day	2.4E-04
			Exp. Route Total								1.4E-08					2.4E-04
		Exposure Point Total									1.5E-07					2.5E-03
	Exposure Medium Total										1.5E-07					2.5E-03
Surface Water Total											1.5E-07					2.5E-03
										Total of Receptor Risks Across All Media	1.5E-07				Total of Receptor Hazards Across All Media	2.5E-03

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Site 28 Soil*	Ingestion	Benzo(a)pyrene	2.9E-01	mg/kg	NA	NA	7.3E+00	1/(mg/kg-day)	NA	4.0E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	3.5E-01	mg/kg	NA	NA	7.3E-01	1/(mg/kg-day)	NA	4.8E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.0E-01	mg/kg	NA	NA	7.3E+00	1/(mg/kg-day)	NA	4.1E-07	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.2E-01	mg/kg	NA	NA	7.3E-01	1/(mg/kg-day)	NA	4.3E-07	mg/kg/day	NA	NA	NA
				n-Nitroso-di-n-propylamine	1.0E-01	mg/kg	NA	NA	7.0E+00	1/(mg/kg-day)	NA	1.4E-07	mg/kg/day	NA	NA	NA
				Aluminum	6.6E+03	mg/kg	NA	NA	NA	NA	NA	9.0E-03	mg/kg/day	1.0E+00	mg/kg/day	9.0E-03
				Antimony	2.6E+01	mg/kg	NA	NA	NA	NA	NA	3.5E-05	mg/kg/day	4.0E-04	mg/kg/day	8.8E-02
				Arsenic	1.2E+02	mg/kg	NA	NA	1.5E+00	1/(mg/kg-day)	NA	1.7E-04	mg/kg/day	3.0E-04	mg/kg/day	5.7E-01
				Barium	4.0E+02	mg/kg	NA	NA	NA	NA	NA	5.4E-04	mg/kg/day	7.0E-02	mg/kg/day	7.8E-03
				Cadmium	4.4E+01	mg/kg	NA	NA	NA	NA	NA	6.1E-05	mg/kg/day	1.0E-03	mg/kg/day	6.1E-02
				Chromium	3.2E+01	mg/kg	NA	NA	NA	NA	NA	4.4E-05	mg/kg/day	3.0E-03	mg/kg/day	1.5E-02
				Copper	3.4E+02	mg/kg	NA	NA	NA	NA	NA	4.7E-04	mg/kg/day	4.0E-02	mg/kg/day	1.2E-02
				Iron	2.2E+04	mg/kg	NA	NA	NA	NA	NA	3.1E-02	mg/kg/day	3.0E-01	mg/kg/day	1.0E-01
				Manganese	2.3E+02	mg/kg	NA	NA	NA	NA	NA	3.2E-04	mg/kg/day	2.0E-02	mg/kg/day	1.6E-02
				Mercury	1.3E+00	mg/kg	NA	NA	NA	NA	NA	1.8E-06	mg/kg/day	3.0E-04	mg/kg/day	6.1E-03
				Nickel	1.4E+01	mg/kg	NA	NA	NA	NA	NA	1.9E-05	mg/kg/day	2.0E-02	mg/kg/day	9.4E-04
				Thallium	4.7E-01	mg/kg	NA	NA	NA	NA	NA	6.4E-07	mg/kg/day	7.0E-05	mg/kg/day	9.1E-03
				Vanadium	2.7E+01	mg/kg	NA	NA	NA	NA	NA	3.6E-05	mg/kg/day	1.0E-03	mg/kg/day	3.6E-02
				Zinc	2.4E+04	mg/kg	NA	NA	NA	NA	NA	3.4E-02	mg/kg/day	3.0E-01	mg/kg/day	1.1E-01
			Exp. Route Total								0.0E+00					1.0E+00
			Dermal Absorption	Benzo(a)pyrene	2.9E-01	mg/kg	NA	NA	7.3E+00	1/(mg/kg-day)	NA	2.1E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	3.5E-01	mg/kg	NA	NA	7.3E-01	1/(mg/kg-day)	NA	2.5E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.0E-01	mg/kg	NA	NA	7.3E+00	1/(mg/kg-day)	NA	2.1E-07	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.2E-01	mg/kg	NA	NA	7.3E-01	1/(mg/kg-day)	NA	2.3E-07	mg/kg/day	NA	NA	NA
				n-Nitroso-di-n-propylamine	1.0E-01	mg/kg	NA	NA	7.0E+00	1/(mg/kg-day)	NA	5.5E-08	mg/kg/day	NA	NA	NA
				Aluminum	6.6E+03	mg/kg	NA	NA	NA	NA	NA	3.6E-04	mg/kg/day	1.0E+00	mg/kg/day	3.6E-04
				Antimony	2.6E+01	mg/kg	NA	NA	NA	NA	NA	1.4E-06	mg/kg/day	6.0E-05	mg/kg/day	2.3E-02
				Arsenic	1.2E+02	mg/kg	NA	NA	1.5E+00	1/(mg/kg-day)	NA	2.0E-05	mg/kg/day	3.0E-04	mg/kg/day	6.8E-02
				Barium	4.0E+02	mg/kg	NA	NA	NA	NA	NA	2.2E-05	mg/kg/day	4.9E-03	mg/kg/day	4.4E-03
				Cadmium	4.4E+01	mg/kg	NA	NA	NA	NA	NA	2.4E-07	mg/kg/day	2.5E-05	mg/kg/day	9.7E-03
				Chromium	3.2E+01	mg/kg	NA	NA	NA	NA	NA	1.8E-06	mg/kg/day	7.5E-05	mg/kg/day	2.3E-02
				Copper	3.4E+02	mg/kg	NA	NA	NA	NA	NA	1.9E-05	mg/kg/day	4.0E-02	mg/kg/day	4.7E-04

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Site 28 Soil*	Dermal	Iron	2.2E+04	mg/kg	NA	NA	NA	NA	NA	1.2E-03	mg/kg/day	3.0E-01	mg/kg/day	4.1E-03
			Absorption	Manganese	2.3E+02	mg/kg	NA	NA	NA	NA	NA	1.3E-05	mg/kg/day	8.0E-04	mg/kg/day	1.6E-02
				Mercury	1.3E+00	mg/kg	NA	NA	NA	NA	NA	7.3E-08	mg/kg/day	2.1E-05	mg/kg/day	3.5E-03
				Nickel	1.4E+01	mg/kg	NA	NA	NA	NA	NA	7.5E-07	mg/kg/day	8.0E-04	mg/kg/day	9.4E-04
				Thallium	4.7E-01	mg/kg	NA	NA	NA	NA	NA	2.6E-08	mg/kg/day	7.0E-05	mg/kg/day	3.6E-04
				Vanadium	2.7E+01	mg/kg	NA	NA	NA	NA	NA	1.5E-06	mg/kg/day	2.6E-05	mg/kg/day	5.6E-02
				Zinc	2.4E+04	mg/kg	NA	NA	NA	NA	NA	1.3E-03	mg/kg/day	3.0E-01	mg/kg/day	4.5E-03
			Exp. Route Total								0.0E+00					2.1E-01
		Exposure Point Total									0.0E+00					1.3E+00
	Exposure Medium Total										0.0E+00					1.3E+00
Soil* Total											0.0E+00					1.3E+00
Groundwater	Groundwater	Tap Water	Ingestion	bis(2-Ethylhexyl)phthalate	2.5E+02	ug/l	NA	NA	1.4E-02	1/(mg/kg-day)	NA	6.8E-03	mg/kg/day	2.0E-02	mg/kg/day	3.4E-01
				Aluminum	1.9E+04	ug/l	NA	NA	NA	NA	NA	5.3E-01	mg/kg/day	1.0E+00	mg/kg/day	5.3E-01
				Antimony	2.1E+00	ug/l	NA	NA	NA	NA	NA	5.8E-05	mg/kg/day	4.0E-04	mg/kg/day	1.4E-01
				Arsenic	3.4E+02	ug/l	NA	NA	1.5E+00	1/(mg/kg-day)	NA	9.4E-03	mg/kg/day	3.0E-04	mg/kg/day	3.1E+01
				Cadmium	3.3E+00	ug/l	NA	NA	NA	NA	NA	9.0E-05	mg/kg/day	5.0E-04	mg/kg/day	1.8E-01
				Chromium	2.7E+01	ug/l	NA	NA	NA	NA	NA	7.5E-04	mg/kg/day	3.0E-03	mg/kg/day	2.5E-01
				Iron	3.6E+04	ug/l	NA	NA	NA	NA	NA	1.0E+00	mg/kg/day	3.0E-01	mg/kg/day	3.3E+00
				Manganese	6.0E+02	ug/l	NA	NA	NA	NA	NA	1.6E-02	mg/kg/day	2.0E-02	mg/kg/day	8.2E-01
				Vanadium	6.2E+01	ug/l	NA	NA	NA	NA	NA	1.7E-03	mg/kg/day	1.0E-03	mg/kg/day	1.7E+00
				Zinc	1.6E+03	ug/l	NA	NA	NA	NA	NA	4.4E-02	mg/kg/day	3.0E-01	mg/kg/day	1.5E-01
			Exp. Route Total								0.0E+00					3.9E+01
			Dermal	bis(2-Ethylhexyl)phthalate	2.5E+02	ug/l	NA	NA	1.4E-02	1/(mg/kg-day)	NA	1.1E-02	mg/kg/day	2.0E-02	mg/kg/day	5.3E-01
				Aluminum	1.9E+04	ug/l	NA	NA	NA	NA	NA	2.8E-03	mg/kg/day	1.0E+00	mg/kg/day	2.8E-03
				Antimony	2.1E+00	ug/l	NA	NA	NA	NA	NA	3.0E-07	mg/kg/day	6.0E-05	mg/kg/day	5.0E-03
				Arsenic	3.4E+02	ug/l	NA	NA	1.5E+00	1/(mg/kg-day)	NA	4.9E-05	mg/kg/day	3.0E-04	mg/kg/day	1.6E-01
				Cadmium	3.3E+00	ug/l	NA	NA	NA	NA	NA	4.7E-07	mg/kg/day	2.5E-05	mg/kg/day	1.9E-02
				Chromium	2.7E+01	ug/l	NA	NA	NA	NA	NA	7.8E-06	mg/kg/day	7.5E-05	mg/kg/day	1.0E-01
				Iron	3.6E+04	ug/l	NA	NA	NA	NA	NA	5.2E-03	mg/kg/day	3.0E-01	mg/kg/day	1.7E-02
				Manganese	6.0E+02	ug/l	NA	NA	NA	NA	NA	8.6E-05	mg/kg/day	8.0E-04	mg/kg/day	1.1E-01
				Vanadium	6.2E+01	ug/l	NA	NA	NA	NA	NA	8.8E-06	mg/kg/day	2.6E-05	mg/kg/day	3.4E-01
				Zinc	1.6E+03	ug/l	NA	NA	NA	NA	NA	1.4E-04	mg/kg/day	3.0E-01	mg/kg/day	4.6E-04
			Exp. Route Total								0.0E+00					1.3E+00
		Exposure Point Total									0.0E+00					4.0E+01
	Exposure Medium Total										0.0E+00					4.0E+01
Groundwater Total											0.0E+00					4.0E+01
											Total of Receptor Risks Across All Media	0.0E+00				Total of Receptor Hazards Across All Media	4.1E+01

Table 7.6.RME Supplement A
Calculation of DAevent
Resident Adult, Groundwater
Site 28 IHDIV-NSWC
Indian Head, Maryland

Chemical of Potential Concern	Groundwater Concentration (CW) (µg/L)	Permeability Coefficient (Kp) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
bis(2-Ethylhexyl)phthalate	2.50E+02	2.5E-02	2.0E-01	1.7E+01	4.0E+01	8.0E-01	0.58	4.3E-05	2
Aluminum	1.93E+04	1.0E-03	NA	NA	NA	NA	0.58	1.1E-05	1
Antimony	2.10E+00	1.0E-03	NA	NA	NA	NA	0.58	1.2E-09	1
Arsenic	3.42E+02	1.0E-03	NA	NA	NA	NA	0.58	2.0E-07	1
Cadmium	3.30E+00	1.0E-03	NA	NA	NA	NA	0.58	1.9E-09	1
Chromium	2.74E+01	2.0E-03	NA	NA	NA	NA	0.58	3.2E-08	1
Iron	3.64E+04	1.0E-03	NA	NA	NA	NA	0.58	2.1E-05	1
Manganese	6.01E+02	1.0E-03	NA	NA	NA	NA	0.58	3.5E-07	1
Vanadium	6.18E+01	1.0E-03	NA	NA	NA	NA	0.58	3.6E-08	1
Zinc	1.62E+03	6.0E-04	NA	NA	NA	NA	0.58	5.6E-07	1

Inorganics: DAevent (mg/cm2-event) =

Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =

$$\text{If } t_{event} \le t^*, \text{then } DA_{event} = 2 \times FA \times K_p \times C_w \sqrt{\frac{6 \times \tau_{event} \times t_{event}}{\pi}} \qquad \text{(eq 2)}$$

$$\text{If } t_{event} \ge t^*, \text{then } DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2 \times \tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right] \qquad \text{(eq 3)}$$

Notes:

Permeability constants from EPA 2001, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Interim).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.

NA - not applicable.

TABLE 7.7.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Site 28 Soil*	Ingestion	Benzo(a)pyrene	2.9E-01	mg/kg	NA	NA	7.3E+00	1/(mg/kg-day)	NA	3.8E-06	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	3.5E-01	mg/kg	NA	NA	7.3E-01	1/(mg/kg-day)	NA	4.5E-06	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.0E-01	mg/kg	NA	NA	7.3E+00	1/(mg/kg-day)	NA	3.8E-06	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.2E-01	mg/kg	NA	NA	7.3E-01	1/(mg/kg-day)	NA	4.1E-06	mg/kg/day	NA	NA	NA
				n-Nitroso-di-n-propylamine	1.0E-01	mg/kg	NA	NA	7.0E+00	1/(mg/kg-day)	NA	1.3E-06	mg/kg/day	NA	NA	NA
				Aluminum	6.6E+03	mg/kg	NA	NA	NA	NA	NA	8.4E-02	mg/kg/day	1.0E+00	mg/kg/day	8.4E-02
				Antimony	2.6E+01	mg/kg	NA	NA	NA	NA	NA	3.3E-04	mg/kg/day	4.0E-04	mg/kg/day	8.2E-01
				Arsenic	1.2E+02	mg/kg	NA	NA	1.5E+00	1/(mg/kg-day)	NA	1.6E-03	mg/kg/day	3.0E-04	mg/kg/day	5.3E+00
				Barium	4.0E+02	mg/kg	NA	NA	NA	NA	NA	5.1E-03	mg/kg/day	7.0E-02	mg/kg/day	7.2E-02
				Cadmium	4.4E+01	mg/kg	NA	NA	NA	NA	NA	5.7E-04	mg/kg/day	1.0E-03	mg/kg/day	5.7E-01
				Chromium	3.2E+01	mg/kg	NA	NA	NA	NA	NA	4.1E-04	mg/kg/day	3.0E-03	mg/kg/day	1.4E-01
				Copper	3.4E+02	mg/kg	NA	NA	NA	NA	NA	4.4E-03	mg/kg/day	4.0E-02	mg/kg/day	1.1E-01
				Iron	2.2E+04	mg/kg	NA	NA	NA	NA	NA	2.9E-01	mg/kg/day	3.0E-01	mg/kg/day	9.6E-01
				Manganese	2.3E+02	mg/kg	NA	NA	NA	NA	NA	3.0E-03	mg/kg/day	2.0E-02	mg/kg/day	1.5E-01
				Mercury	1.3E+00	mg/kg	NA	NA	NA	NA	NA	1.7E-05	mg/kg/day	3.0E-04	mg/kg/day	5.7E-02
				Nickel	1.4E+01	mg/kg	NA	NA	NA	NA	NA	1.8E-04	mg/kg/day	2.0E-02	mg/kg/day	8.8E-03
				Thallium	4.7E-01	mg/kg	NA	NA	NA	NA	NA	6.0E-06	mg/kg/day	7.0E-05	mg/kg/day	8.5E-02
				Vanadium	2.7E+01	mg/kg	NA	NA	NA	NA	NA	3.4E-04	mg/kg/day	1.0E-03	mg/kg/day	3.4E-01
				Zinc	2.4E+04	mg/kg	NA	NA	NA	NA	NA	3.1E-01	mg/kg/day	3.0E-01	mg/kg/day	1.0E+00
			Exp. Route Total								0.0E+00					9.7E+00
			Dermal	Benzo(a)pyrene	2.9E-01	mg/kg	NA	NA	7.3E+00	1/(mg/kg-day)	NA	1.4E-06	mg/kg/day	NA	NA	NA
			Absorption	Benzo(b)fluoranthene	3.5E-01	mg/kg	NA	NA	7.3E-01	1/(mg/kg-day)	NA	1.6E-06	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.0E-01	mg/kg	NA	NA	7.3E+00	1/(mg/kg-day)	NA	1.4E-06	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.2E-01	mg/kg	NA	NA	7.3E-01	1/(mg/kg-day)	NA	1.5E-06	mg/kg/day	NA	NA	NA
				n-Nitroso-di-n-propylamine	1.0E-01	mg/kg	NA	NA	7.0E+00	1/(mg/kg-day)	NA	3.6E-07	mg/kg/day	NA	NA	NA
				Aluminum	6.6E+03	mg/kg	NA	NA	NA	NA	NA	2.3E-03	mg/kg/day	1.0E+00	mg/kg/day	2.3E-03
				Antimony	2.6E+01	mg/kg	NA	NA	NA	NA	NA	9.2E-06	mg/kg/day	6.0E-05	mg/kg/day	1.5E-01
				Arsenic	1.2E+02	mg/kg	NA	NA	1.5E+00	1/(mg/kg-day)	NA	1.3E-04	mg/kg/day	3.0E-04	mg/kg/day	4.4E-01
				Barium	4.0E+02	mg/kg	NA	NA	NA	NA	NA	1.4E-04	mg/kg/day	4.9E-03	mg/kg/day	2.9E-02
				Cadmium	4.4E+01	mg/kg	NA	NA	NA	NA	NA	1.6E-06	mg/kg/day	2.5E-05	mg/kg/day	6.3E-02
				Chromium	3.2E+01	mg/kg	NA	NA	NA	NA	NA	1.1E-05	mg/kg/day	7.5E-05	mg/kg/day	1.5E-01
				Copper	3.4E+02	mg/kg	NA	NA	NA	NA	NA	1.2E-04	mg/kg/day	4.0E-02	mg/kg/day	3.1E-03

TABLE 7.7.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Site 28 Soil*	Dermal	Iron	2.2E+04	mg/kg	NA	NA	NA	NA	NA	8.0E-03	mg/kg/day	3.0E-01	mg/kg/day	2.7E-02
			Absorption	Manganese	2.3E+02	mg/kg	NA	NA	NA	NA	NA	8.4E-05	mg/kg/day	8.0E-04	mg/kg/day	1.0E-01
				Mercury	1.3E+00	mg/kg	NA	NA	NA	NA	NA	4.8E-07	mg/kg/day	2.1E-05	mg/kg/day	2.3E-02
				Nickel	1.4E+01	mg/kg	NA	NA	NA	NA	NA	4.9E-06	mg/kg/day	8.0E-04	mg/kg/day	6.2E-03
				Thallium	4.7E-01	mg/kg	NA	NA	NA	NA	NA	1.7E-07	mg/kg/day	7.0E-05	mg/kg/day	2.4E-03
				Vanadium	2.7E+01	mg/kg	NA	NA	NA	NA	NA	9.5E-06	mg/kg/day	2.6E-05	mg/kg/day	3.7E-01
				Zinc	2.4E+04	mg/kg	NA	NA	NA	NA	NA	8.8E-03	mg/kg/day	3.0E-01	mg/kg/day	2.9E-02
			Exp. Route Total								0.0E+00					1.4E+00
		Exposure Point Total									0.0E+00					1.1E+01
	Exposure Medium Total										0.0E+00					1.1E+01
Soil* Total											0.0E+00					1.1E+01
Groundwater	Groundwater	Tap Water	Ingestion	bis(2-Ethylhexyl)phthalate	2.5E+02	ug/l	NA	NA	1.4E-02	1/(mg/kg-day)	NA	1.6E-02	mg/kg/day	2.0E-02	mg/kg/day	8.0E-01
				Aluminum	1.9E+04	ug/l	NA	NA	NA	NA	NA	1.2E+00	mg/kg/day	1.0E+00	mg/kg/day	1.2E+00
				Antimony	2.1E+00	ug/l	NA	NA	NA	NA	NA	1.3E-04	mg/kg/day	4.0E-04	mg/kg/day	3.4E-01
				Arsenic	3.4E+02	ug/l	NA	NA	1.5E+00	1/(mg/kg-day)	NA	2.2E-02	mg/kg/day	3.0E-04	mg/kg/day	7.3E+01
				Cadmium	3.3E+00	ug/l	NA	NA	NA	NA	NA	2.1E-04	mg/kg/day	5.0E-04	mg/kg/day	4.2E-01
				Chromium	2.7E+01	ug/l	NA	NA	NA	NA	NA	1.8E-03	mg/kg/day	3.0E-03	mg/kg/day	5.8E-01
				Iron	3.6E+04	ug/l	NA	NA	NA	NA	NA	2.3E+00	mg/kg/day	3.0E-01	mg/kg/day	7.8E+00
				Manganese	6.0E+02	ug/l	NA	NA	NA	NA	NA	3.8E-02	mg/kg/day	2.0E-02	mg/kg/day	1.9E+00
				Vanadium	6.2E+01	ug/l	NA	NA	NA	NA	NA	4.0E-03	mg/kg/day	1.0E-03	mg/kg/day	4.0E+00
				Zinc	1.6E+03	ug/l	NA	NA	NA	NA	NA	1.0E-01	mg/kg/day	3.0E-01	mg/kg/day	3.5E-01
			Exp. Route Total								0.0E+00					9.0E+01
			Dermal	bis(2-Ethylhexyl)phthalate	2.5E+02	ug/l	NA	NA	1.4E-02	1/(mg/kg-day)	NA	2.4E-02	mg/kg/day	2.0E-02	mg/kg/day	1.2E+00
				Aluminum	1.9E+04	ug/l	NA	NA	NA	NA	NA	8.1E-03	mg/kg/day	1.0E+00	mg/kg/day	8.1E-03
				Antimony	2.1E+00	ug/l	NA	NA	NA	NA	NA	8.9E-07	mg/kg/day	6.0E-05	mg/kg/day	1.5E-02
				Arsenic	3.4E+02	ug/l	NA	NA	1.5E+00	1/(mg/kg-day)	NA	1.4E-04	mg/kg/day	3.0E-04	mg/kg/day	4.8E-01
				Cadmium	3.3E+00	ug/l	NA	NA	NA	NA	NA	1.4E-06	mg/kg/day	2.5E-05	mg/kg/day	5.6E-02
				Chromium	2.7E+01	ug/l	NA	NA	NA	NA	NA	2.3E-05	mg/kg/day	7.5E-05	mg/kg/day	3.1E-01
				Iron	3.6E+04	ug/l	NA	NA	NA	NA	NA	1.5E-02	mg/kg/day	3.0E-01	mg/kg/day	5.1E-02
				Manganese	6.0E+02	ug/l	NA	NA	NA	NA	NA	2.5E-04	mg/kg/day	8.0E-04	mg/kg/day	3.2E-01
				Vanadium	6.2E+01	ug/l	NA	NA	NA	NA	NA	2.6E-05	mg/kg/day	2.6E-05	mg/kg/day	1.0E+00
				Zinc	1.6E+03	ug/l	NA	NA	NA	NA	NA	4.1E-04	mg/kg/day	3.0E-01	mg/kg/day	1.4E-03
			Exp. Route Total								0.0E+00					2.2E+00
		Exposure Point Total									0.0E+00					9.2E+01
	Exposure Medium Total										0.0E+00					9.2E+01
Groundwater Total											0.0E+00					9.2E+01
Total of Receptor Risks Across All Media											0.0E+00	Total of Receptor Hazards Across All Media				1.0E+02

Table 7.7.RME Supplement A
Calculation of DAevent
Resident Child, Groundwater
Site 28 IHDIV-NSWC
Indian Head, Maryland

Chemical of Potential Concern	Groundwater Concentration (CW) (µg/L)	Permeability Coefficient (Kp) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
bis(2-Ethylhexyl)phthalat	2.50E+02	2.5E-02	2.0E-01	1.7E+01	4.0E+01	8.0E-01	1	5.6E-05	2
Aluminum	1.93E+04	1.0E-03	NA	NA	NA	NA	1	1.9E-05	1
Antimony	2.10E+00	1.0E-03	NA	NA	NA	NA	1	2.1E-09	1
Arsenic	3.42E+02	1.0E-03	NA	NA	NA	NA	1	3.4E-07	1
Cadmium	3.30E+00	1.0E-03	NA	NA	NA	NA	1	3.3E-09	1
Chromium	2.74E+01	2.0E-03	NA	NA	NA	NA	1	5.5E-08	1
Iron	3.64E+04	1.0E-03	NA	NA	NA	NA	1	3.6E-05	1
Manganese	6.01E+02	1.0E-03	NA	NA	NA	NA	1	6.0E-07	1
Vanadium	6.18E+01	1.0E-03	NA	NA	NA	NA	1	6.2E-08	1
Zinc	1.62E+03	6.0E-04	NA	NA	NA	NA	1	9.7E-07	1

Inorganics: DAevent (mg/cm2-event) =

Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =

$$\text{If } t_{event} \le t^*, \text{then } DA_{event} = 2 \times FA \times K_p \times C_w \sqrt{\frac{6 \times \tau_{event} \times t_{event}}{\pi}} \qquad \text{(eq 2)}$$

$$\text{If } t_{event} \ge t^*, \text{then } DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2 \times \tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right] \qquad \text{(eq 3)}$$

Notes:

Permeability constants from EPA 2001, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Interim).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.

NA - not applicable.

TABLE 7.8.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Site 28 Soil*	Ingestion	Benzo(a)pyrene	2.9E-01	mg/kg	4.6E-07	NA	7.3E+00	1/(mg/kg-day)	3.4E-06	NA	NA	NA	NA	NA
				Benzo(b)fluoranthene	3.5E-01	mg/kg	5.5E-07	NA	7.3E-01	1/(mg/kg-day)	4.0E-07	NA	NA	NA	NA	NA
				Dibenz(a,h)anthracene	3.0E-01	mg/kg	4.7E-07	NA	7.3E+00	1/(mg/kg-day)	3.4E-06	NA	NA	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.2E-01	mg/kg	4.9E-07	NA	7.3E-01	1/(mg/kg-day)	3.6E-07	NA	NA	NA	NA	NA
				n-Nitroso-di-n-propylamine	1.0E-01	mg/kg	1.6E-07	NA	7.0E+00	1/(mg/kg-day)	1.1E-06	NA	NA	NA	NA	NA
				Aluminum	6.6E+03	mg/kg	1.0E-02	NA	NA	NA	NA	NA	NA	1.0E+00	mg/kg/day	NA
				Antimony	2.6E+01	mg/kg	4.0E-05	NA	NA	NA	NA	NA	NA	4.0E-04	mg/kg/day	NA
				Arsenic	1.2E+02	mg/kg	1.9E-04	NA	1.5E+00	1/(mg/kg-day)	2.9E-04	NA	NA	3.0E-04	mg/kg/day	NA
				Barium	4.0E+02	mg/kg	6.2E-04	NA	NA	NA	NA	NA	NA	7.0E-02	mg/kg/day	NA
				Cadmium	4.4E+01	mg/kg	6.9E-05	NA	NA	NA	NA	NA	NA	1.0E-03	mg/kg/day	NA
				Chromium	3.2E+01	mg/kg	5.0E-05	NA	NA	NA	NA	NA	NA	3.0E-03	mg/kg/day	NA
				Copper	3.4E+02	mg/kg	5.4E-04	NA	NA	NA	NA	NA	NA	4.0E-02	mg/kg/day	NA
				Iron	2.2E+04	mg/kg	3.5E-02	NA	NA	NA	NA	NA	NA	3.0E-01	mg/kg/day	NA
				Manganese	2.3E+02	mg/kg	3.7E-04	NA	NA	NA	NA	NA	NA	2.0E-02	mg/kg/day	NA
				Mercury	1.3E+00	mg/kg	2.1E-06	NA	NA	NA	NA	NA	NA	3.0E-04	mg/kg/day	NA
				Nickel	1.4E+01	mg/kg	2.2E-05	NA	NA	NA	NA	NA	NA	2.0E-02	mg/kg/day	NA
				Thallium	4.7E-01	mg/kg	7.3E-07	NA	NA	NA	NA	NA	NA	7.0E-05	mg/kg/day	NA
				Vanadium	2.7E+01	mg/kg	4.1E-05	NA	NA	NA	NA	NA	NA	1.0E-03	mg/kg/day	NA
				Zinc	2.4E+04	mg/kg	3.8E-02	NA	NA	NA	NA	NA	NA	3.0E-01	mg/kg/day	NA
			Exp. Route Total								3.0E-04					0.0E+00
			Dermal	Benzo(a)pyrene	2.9E-01	mg/kg	1.9E-07	NA	7.3E+00	1/(mg/kg-day)	1.4E-06	NA	NA	NA	NA	NA
			Absorption	Benzo(b)fluoranthene	3.5E-01	mg/kg	2.3E-07	NA	7.3E-01	1/(mg/kg-day)	1.7E-07	NA	NA	NA	NA	NA
				Dibenz(a,h)anthracene	3.0E-01	mg/kg	1.9E-07	NA	7.3E+00	1/(mg/kg-day)	1.4E-06	NA	NA	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.2E-01	mg/kg	2.0E-07	NA	7.3E-01	1/(mg/kg-day)	1.5E-07	NA	NA	NA	NA	NA
				n-Nitroso-di-n-propylamine	1.0E-01	mg/kg	4.9E-08	NA	7.0E+00	1/(mg/kg-day)	3.5E-07	NA	NA	NA	NA	NA
				Aluminum	6.6E+03	mg/kg	3.2E-04	NA	NA	NA	NA	NA	NA	1.0E+00	mg/kg/day	NA
				Antimony	2.6E+01	mg/kg	1.3E-06	NA	NA	NA	NA	NA	NA	6.0E-05	mg/kg/day	NA
				Arsenic	1.2E+02	mg/kg	1.8E-05	NA	1.5E+00	1/(mg/kg-day)	2.8E-05	NA	NA	3.0E-04	mg/kg/day	NA
				Barium	4.0E+02	mg/kg	2.0E-05	NA	NA	NA	NA	NA	NA	4.9E-03	mg/kg/day	NA
				Cadmium	4.4E+01	mg/kg	2.2E-07	NA	NA	NA	NA	NA	NA	2.5E-05	mg/kg/day	NA
				Chromium	3.2E+01	mg/kg	1.6E-06	NA	NA	NA	NA	NA	NA	7.5E-05	mg/kg/day	NA
				Copper	3.4E+02	mg/kg	1.7E-05	NA	NA	NA	NA	NA	NA	4.0E-02	mg/kg/day	NA

TABLE 7.8.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Site 28 Soil*	Dermal	Iron	2.2E+04	mg/kg	1.1E-03	NA	NA	NA	NA	NA	NA	3.0E-01	mg/kg/day	NA
			Absorption	Manganese	2.3E+02	mg/kg	1.2E-05	NA	NA	NA	NA	NA	NA	8.0E-04	mg/kg/day	NA
				Mercury	1.3E+00	mg/kg	6.6E-08	NA	NA	NA	NA	NA	NA	2.1E-05	mg/kg/day	NA
				Nickel	1.4E+01	mg/kg	6.8E-07	NA	NA	NA	NA	NA	NA	8.0E-04	mg/kg/day	NA
				Thallium	4.7E-01	mg/kg	2.3E-08	NA	NA	NA	NA	NA	NA	7.0E-05	mg/kg/day	NA
				Vanadium	2.7E+01	mg/kg	1.3E-06	NA	NA	NA	NA	NA	NA	2.6E-05	mg/kg/day	NA
				Zinc	2.4E+04	mg/kg	1.2E-03	NA	NA	NA	NA	NA	NA	3.0E-01	mg/kg/day	NA
			Exp. Route Total								3.1E-05					0.0E+00
		Exposure Point Total									3.3E-04					0.0E+00
	Exposure Medium Total										3.3E-04					0.0E+00
Soil* Total											3.3E-04					0.0E+00
Groundwater	Groundwater	Tap Water	Ingestion	bis(2-Ethylhexyl)phthalate	2.5E+02	ug/l	3.7E-03	NA	1.4E-02	1/(mg/kg-day)	5.2E-05	NA	NA	2.0E-02	mg/kg/day	NA
				Aluminum	1.9E+04	ug/l	2.9E-01	NA	NA	NA	NA	NA	NA	1.0E+00	mg/kg/day	NA
				Antimony	2.1E+00	ug/l	3.1E-05	NA	NA	NA	NA	NA	NA	4.0E-04	mg/kg/day	NA
				Arsenic	3.4E+02	ug/l	5.1E-03	NA	1.5E+00	1/(mg/kg-day)	7.7E-03	NA	NA	3.0E-04	mg/kg/day	NA
				Cadmium	3.3E+00	ug/l	4.9E-05	NA	NA	NA	NA	NA	NA	5.0E-04	mg/kg/day	NA
				Chromium	2.7E+01	ug/l	4.1E-04	NA	NA	NA	NA	NA	NA	3.0E-03	mg/kg/day	NA
				Iron	3.6E+04	ug/l	5.4E-01	NA	NA	NA	NA	NA	NA	3.0E-01	mg/kg/day	NA
				Manganese	6.0E+02	ug/l	9.0E-03	NA	NA	NA	NA	NA	NA	2.0E-02	mg/kg/day	NA
				Vanadium	6.2E+01	ug/l	9.2E-04	NA	NA	NA	NA	NA	NA	1.0E-03	mg/kg/day	NA
				Zinc	1.6E+03	ug/l	2.4E-02	NA	NA	NA	NA	NA	NA	3.0E-01	mg/kg/day	NA
			Exp. Route Total								7.7E-03					0.0E+00
			Dermal	bis(2-Ethylhexyl)phthalate	2.5E+02	ug/l	5.7E-03	NA	1.4E-02	1/(mg/kg-day)	7.9E-05	NA	NA	2.0E-02	mg/kg/day	NA
				Aluminum	1.9E+04	ug/l	1.6E-03	NA	NA	NA	NA	NA	NA	1.0E+00	mg/kg/day	NA
				Antimony	2.1E+00	ug/l	1.8E-07	NA	NA	NA	NA	NA	NA	6.0E-05	mg/kg/day	NA
				Arsenic	3.4E+02	ug/l	2.9E-05	NA	1.5E+00	1/(mg/kg-day)	4.4E-05	NA	NA	3.0E-04	mg/kg/day	NA
				Cadmium	3.3E+00	ug/l	2.8E-07	NA	NA	NA	NA	NA	NA	2.5E-05	mg/kg/day	NA
				Chromium	2.7E+01	ug/l	4.7E-06	NA	NA	NA	NA	NA	NA	7.5E-05	mg/kg/day	NA
				Iron	3.6E+04	ug/l	3.1E-03	NA	NA	NA	NA	NA	NA	3.0E-01	mg/kg/day	NA
				Manganese	6.0E+02	ug/l	5.1E-05	NA	NA	NA	NA	NA	NA	8.0E-04	mg/kg/day	NA
				Vanadium	6.2E+01	ug/l	5.3E-06	NA	NA	NA	NA	NA	NA	2.6E-05	mg/kg/day	NA
				Zinc	1.6E+03	ug/l	8.3E-05	NA	NA	NA	NA	NA	NA	3.0E-01	mg/kg/day	NA
			Exp. Route Total								1.2E-04					0.0E+00
		Exposure Point Total									7.8E-03					0.0E+00
	Exposure Medium Total										7.8E-03					0.0E+00
Groundwater Total											7.8E-03					0.0E+00
											Total of Receptor Risks Across All Media					Total of Receptor Hazards Across All Media
											8.2E-03					0.0E+00

* Surface and subsurface soil combined.

TABLE 7.9.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Site 28 Soil*	Ingestion	Benzo(a)pyrene	2.9E-01	mg/kg	2.0E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.4E-07	1.4E-06	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	3.5E-01	mg/kg	2.4E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.7E-08	1.7E-06	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.0E-01	mg/kg	2.0E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.5E-07	1.4E-06	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.2E-01	mg/kg	2.1E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.6E-08	1.5E-06	mg/kg/day	NA	NA	NA
				n-Nitroso-di-n-propylamine	1.0E-01	mg/kg	6.7E-09	mg/kg/day	7.0E+00	1/(mg/kg-day)	4.7E-08	4.7E-07	mg/kg/day	NA	NA	NA
				Aluminum	6.6E+03	mg/kg	4.4E-04	mg/kg/day	NA	NA	NA	3.1E-02	mg/kg/day	1.0E+00	mg/kg/day	3.1E-02
				Antimony	2.6E+01	mg/kg	1.7E-06	mg/kg/day	NA	NA	NA	1.2E-04	mg/kg/day	4.0E-04	mg/kg/day	3.0E-01
				Arsenic	1.2E+02	mg/kg	8.3E-06	mg/kg/day	1.5E+00	1/(mg/kg-day)	1.2E-05	5.8E-04	mg/kg/day	3.0E-04	mg/kg/day	1.9E+00
				Barium	4.0E+02	mg/kg	2.7E-05	mg/kg/day	NA	NA	NA	1.9E-03	mg/kg/day	7.0E-02	mg/kg/day	2.7E-02
				Cadmium	4.4E+01	mg/kg	3.0E-06	mg/kg/day	NA	NA	NA	2.1E-04	mg/kg/day	1.0E-03	mg/kg/day	2.1E-01
				Chromium	3.2E+01	mg/kg	2.2E-06	mg/kg/day	NA	NA	NA	1.5E-04	mg/kg/day	2.0E-02	mg/kg/day	7.5E-03
				Copper	3.4E+02	mg/kg	2.3E-05	mg/kg/day	NA	NA	NA	1.6E-03	mg/kg/day	4.0E-02	mg/kg/day	4.0E-02
				Iron	2.2E+04	mg/kg	1.5E-03	mg/kg/day	NA	NA	NA	1.1E-01	mg/kg/day	3.0E-01	mg/kg/day	3.5E-01
				Manganese	2.3E+02	mg/kg	1.6E-05	mg/kg/day	NA	NA	NA	1.1E-03	mg/kg/day	2.0E-02	mg/kg/day	5.5E-02
				Mercury	1.3E+00	mg/kg	8.9E-08	mg/kg/day	NA	NA	NA	6.3E-06	mg/kg/day	3.0E-04	mg/kg/day	2.1E-02
				Nickel	1.4E+01	mg/kg	9.2E-07	mg/kg/day	NA	NA	NA	6.5E-05	mg/kg/day	2.0E-02	mg/kg/day	3.2E-03
				Thallium	4.7E-01	mg/kg	3.1E-08	mg/kg/day	NA	NA	NA	2.2E-06	mg/kg/day	7.0E-05	mg/kg/day	3.1E-02
				Vanadium	2.7E+01	mg/kg	1.8E-06	mg/kg/day	NA	NA	NA	1.2E-04	mg/kg/day	1.0E-03	mg/kg/day	1.2E-01
				Zinc	2.4E+04	mg/kg	1.6E-03	mg/kg/day	NA	NA	NA	1.1E-01	mg/kg/day	3.0E-01	mg/kg/day	3.8E-01
			Exp. Route Total								1.3E-05					3.5E+00
			Dermal Absorption	Benzo(a)pyrene	2.9E-01	mg/kg	5.3E-09	mg/kg/day	7.3E+00	1/(mg/kg-day)	3.9E-08	3.7E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	3.5E-01	mg/kg	6.4E-09	mg/kg/day	7.3E-01	1/(mg/kg-day)	4.6E-09	4.5E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.0E-01	mg/kg	5.4E-09	mg/kg/day	7.3E+00	1/(mg/kg-day)	4.0E-08	3.8E-07	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.2E-01	mg/kg	5.7E-09	mg/kg/day	7.3E-01	1/(mg/kg-day)	4.2E-09	4.0E-07	mg/kg/day	NA	NA	NA
				n-Nitroso-di-n-propylamine	1.0E-01	mg/kg	1.4E-09	mg/kg/day	7.0E+00	1/(mg/kg-day)	9.7E-09	9.7E-08	mg/kg/day	NA	NA	NA
				Aluminum	6.6E+03	mg/kg	9.1E-06	mg/kg/day	NA	NA	NA	6.3E-04	mg/kg/day	1.0E+00	mg/kg/day	6.3E-04
				Antimony	2.6E+01	mg/kg	3.5E-08	mg/kg/day	NA	NA	NA	2.5E-06	mg/kg/day	6.0E-05	mg/kg/day	4.1E-02
				Arsenic	1.2E+02	mg/kg	5.1E-07	mg/kg/day	1.5E+00	1/(mg/kg-day)	7.7E-07	3.6E-05	mg/kg/day	3.0E-04	mg/kg/day	1.2E-01
				Barium	4.0E+02	mg/kg	5.5E-07	mg/kg/day	NA	NA	NA	3.8E-05	mg/kg/day	4.9E-03	mg/kg/day	7.8E-03
				Cadmium	4.4E+01	mg/kg	6.1E-09	mg/kg/day	NA	NA	NA	4.3E-07	mg/kg/day	2.5E-05	mg/kg/day	1.7E-02
				Chromium	3.2E+01	mg/kg	4.4E-08	mg/kg/day	NA	NA	NA	3.1E-06	mg/kg/day	5.0E-04	mg/kg/day	6.2E-03
				Copper	3.4E+02	mg/kg	4.8E-07	mg/kg/day	NA	NA	NA	3.3E-05	mg/kg/day	4.0E-02	mg/kg/day	8.3E-04

TABLE 7.9.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Site 28 Soil*	Dermal	Iron	2.2E+04	mg/kg	3.1E-05	mg/kg/day	NA	NA	NA	2.2E-03	mg/kg/day	3.0E-01	mg/kg/day	7.2E-03
			Absorption	Manganese	2.3E+02	mg/kg	3.2E-07	mg/kg/day	NA	NA	NA	2.3E-05	mg/kg/day	8.0E-04	mg/kg/day	2.8E-02
				Mercury	1.3E+00	mg/kg	1.8E-09	mg/kg/day	NA	NA	NA	1.3E-07	mg/kg/day	2.1E-05	mg/kg/day	6.1E-03
				Nickel	1.4E+01	mg/kg	1.9E-08	mg/kg/day	NA	NA	NA	1.3E-06	mg/kg/day	8.0E-04	mg/kg/day	1.7E-03
				Thallium	4.7E-01	mg/kg	6.5E-10	mg/kg/day	NA	NA	NA	4.5E-08	mg/kg/day	7.0E-05	mg/kg/day	6.5E-04
				Vanadium	2.7E+01	mg/kg	3.7E-08	mg/kg/day	NA	NA	NA	2.6E-06	mg/kg/day	2.6E-05	mg/kg/day	9.9E-02
				Zinc	2.4E+04	mg/kg	3.4E-05	mg/kg/day	NA	NA	NA	2.4E-03	mg/kg/day	3.0E-01	mg/kg/day	7.9E-03
			Exp. Route Total								8.7E-07					3.4E-01
		Exposure Point Total									1.4E-05					3.9E+00
	Exposure Medium Total										1.4E-05					3.9E+00
Soil* Total											1.4E-05					3.9E+00
Groundwater	Groundwater	Water in Excavation Pit	Dermal	Aluminum	8.2E+03	ug/l	3.0E-05	NA	NA	NA	NA	2.1E-03	mg/kg/day	1.0E+00	mg/kg/day	2.1E-03
				Antimony	3.1E+00	ug/l	1.1E-08	NA	NA	NA	NA	8.0E-07	mg/kg/day	6.0E-05	mg/kg/day	1.3E-02
				Arsenic	3.2E+02	ug/l	1.2E-06	NA	1.5E+00	mg/kg/day	1.8E-06	8.2E-05	mg/kg/day	3.0E-04	mg/kg/day	2.7E-01
				Cadmium	1.0E+01	ug/l	3.7E-08	NA	NA	NA	NA	2.6E-06	mg/kg/day	2.5E-05	mg/kg/day	1.0E-01
				Chromium	1.2E+01	ug/l	9.0E-08	NA	NA	NA	NA	6.3E-06	mg/kg/day	5.0E-04	mg/kg/day	1.3E-02
				Iron	1.5E+04	ug/l	5.6E-05	NA	NA	NA	NA	3.9E-03	mg/kg/day	3.0E-01	mg/kg/day	1.3E-02
				Vanadium	2.4E+01	ug/l	6.7E-08	NA	NA	NA	NA	6.1E-06	mg/kg/day	2.6E-05	mg/kg/day	2.3E-01
				Zinc	1.2E+03	ug/l	2.7E-06	NA	NA	NA	NA	1.9E-04	mg/kg/day	3.0E-01	mg/kg/day	6.4E-04
			Exp. Route Total								1.8E-06					6.5E-01
		Exposure Point Total									1.8E-06					6.5E-01
	Exposure Medium Total										1.8E-06					6.5E-01
Groundwater Total											1.8E-06					6.5E-01
											Total of Receptor Risks Across All Media	1.5E-05		Total of Receptor Hazards Across All Media		4.5E+00

* Surface and subsurface soil combined.

Table 7.9.RME Supplement A
Calculation of DAevent
Construction Worker, Groundwater
Site 28 IHDIV-NSWC
Indian Head, Maryland

Chemical of Potential Concern	Groundwater Concentration (CW) (µg/L)	Permeability Coefficient (Kp) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
Aluminum	8.2E+03	1.0E-03	NA	NA	NA	NA	8	6.6E-05	1
Antimony	3.1E+00	1.0E-03	NA	NA	NA	NA	8	2.5E-08	1
Arsenic	3.2E+02	1.0E-03	NA	NA	NA	NA	8	2.5E-06	1
Cadmium	1.0E+01	1.0E-03	NA	NA	NA	NA	8	8.0E-08	1
Chromium	1.2E+01	2.0E-03	NA	NA	NA	NA	8	2.0E-07	1
Iron	1.5E+04	1.0E-03	NA	NA	NA	NA	8	1.2E-04	1
Vanadium	2.4E+01	1.0E-03	NA	NA	NA	NA	8	1.9E-07	1
Zinc	1.2E+03	6.0E-04	NA	NA	NA	NA	8	5.9E-06	1

Inorganics: DAevent (mg/cm2-event) =
Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =

$$\text{If } t_{event} \le t^*, \text{then } DA_{event} = 2 \times FA \times K_p \times C_w \sqrt{\frac{6 \times \tau_{event} \times t_{event}}{\pi}} \qquad \text{(eq 2)}$$

$$\text{If } t_{event} \ge t^*, \text{ then } DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2 \times \tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right] \qquad \text{(eq 3)}$$

Notes:
Permeability constants from EPA 2001, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Interim)*, EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.
NA - not applicable.

TABLE 7.10.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Trespasser
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Site 28 Soil*	Ingestion	Benzo(a)pyrene	2.9E-01	mg/kg	2.1E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.5E-07	6.0E-08	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	3.5E-01	mg/kg	2.5E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.8E-08	7.2E-08	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.0E-01	mg/kg	2.1E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.5E-07	6.1E-08	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.2E-01	mg/kg	2.2E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.6E-08	6.4E-08	mg/kg/day	NA	NA	NA
				n-Nitroso-di-n-propylamine	1.0E-01	mg/kg	7.0E-09	mg/kg/day	7.0E+00	1/(mg/kg-day)	4.9E-08	2.0E-08	mg/kg/day	NA	NA	NA
				Aluminum	6.6E+03	mg/kg	4.6E-04	mg/kg/day	NA	NA	NA	1.3E-03	mg/kg/day	1.0E+00	mg/kg/day	1.3E-03
				Antimony	2.6E+01	mg/kg	1.8E-06	mg/kg/day	NA	NA	NA	5.2E-06	mg/kg/day	4.0E-04	mg/kg/day	1.3E-02
				Arsenic	1.2E+02	mg/kg	8.6E-06	mg/kg/day	1.5E+00	1/(mg/kg-day)	1.3E-05	2.5E-05	mg/kg/day	3.0E-04	mg/kg/day	8.4E-02
				Barium	4.0E+02	mg/kg	2.8E-05	mg/kg/day	NA	NA	NA	8.1E-05	mg/kg/day	7.0E-02	mg/kg/day	1.2E-03
				Cadmium	4.4E+01	mg/kg	3.1E-06	mg/kg/day	NA	NA	NA	9.0E-06	mg/kg/day	1.0E-03	mg/kg/day	9.0E-03
				Chromium	3.2E+01	mg/kg	2.2E-06	mg/kg/day	NA	NA	NA	6.5E-06	mg/kg/day	3.0E-03	mg/kg/day	2.2E-03
				Copper	3.4E+02	mg/kg	2.4E-05	mg/kg/day	NA	NA	NA	7.0E-05	mg/kg/day	4.0E-02	mg/kg/day	1.8E-03
				Iron	2.2E+04	mg/kg	1.6E-03	mg/kg/day	NA	NA	NA	4.6E-03	mg/kg/day	3.0E-01	mg/kg/day	1.5E-02
				Manganese	2.3E+02	mg/kg	1.6E-05	mg/kg/day	NA	NA	NA	4.8E-05	mg/kg/day	2.0E-02	mg/kg/day	2.4E-03
				Mercury	1.3E+00	mg/kg	9.3E-08	mg/kg/day	NA	NA	NA	2.7E-07	mg/kg/day	3.0E-04	mg/kg/day	9.0E-04
				Nickel	1.4E+01	mg/kg	9.6E-07	mg/kg/day	NA	NA	NA	2.8E-06	mg/kg/day	2.0E-02	mg/kg/day	1.4E-04
				Thallium	4.7E-01	mg/kg	3.3E-08	mg/kg/day	NA	NA	NA	9.5E-08	mg/kg/day	7.0E-05	mg/kg/day	1.4E-03
				Vanadium	2.7E+01	mg/kg	1.9E-06	mg/kg/day	NA	NA	NA	5.4E-06	mg/kg/day	1.0E-03	mg/kg/day	5.4E-03
				Zinc	2.4E+04	mg/kg	1.7E-03	mg/kg/day	NA	NA	NA	5.0E-03	mg/kg/day	3.0E-01	mg/kg/day	1.7E-02
			Exp. Route Total								1.3E-05					1.5E-01
			Dermal Absorption	Benzo(a)pyrene	2.9E-01	mg/kg	4.6E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	3.3E-07	1.3E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	3.5E-01	mg/kg	5.5E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	4.0E-08	1.6E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.0E-01	mg/kg	4.7E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	3.4E-07	1.4E-07	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.2E-01	mg/kg	4.9E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	3.6E-08	1.4E-07	mg/kg/day	NA	NA	NA
				n-Nitroso-di-n-propylamine	1.0E-01	mg/kg	1.2E-08	mg/kg/day	7.0E+00	1/(mg/kg-day)	8.4E-08	3.5E-08	mg/kg/day	NA	NA	NA
				Aluminum	6.6E+03	mg/kg	7.8E-05	mg/kg/day	NA	NA	NA	2.3E-04	mg/kg/day	1.0E+00	mg/kg/day	2.3E-04
				Antimony	2.6E+01	mg/kg	3.1E-07	mg/kg/day	NA	NA	NA	8.9E-07	mg/kg/day	6.0E-05	mg/kg/day	1.5E-02
				Arsenic	1.2E+02	mg/kg	4.4E-06	mg/kg/day	1.5E+00	1/(mg/kg-day)	6.7E-06	1.3E-05	mg/kg/day	3.0E-04	mg/kg/day	4.3E-02
				Barium	4.0E+02	mg/kg	4.7E-06	mg/kg/day	NA	NA	NA	1.4E-05	mg/kg/day	4.9E-03	mg/kg/day	2.8E-03
				Cadmium	4.4E+01	mg/kg	5.3E-08	mg/kg/day	NA	NA	NA	1.5E-07	mg/kg/day	2.5E-05	mg/kg/day	6.2E-03
				Chromium	3.2E+01	mg/kg	3.8E-07	mg/kg/day	NA	NA	NA	1.1E-06	mg/kg/day	7.5E-05	mg/kg/day	1.5E-02
				Copper	3.4E+02	mg/kg	4.1E-06	mg/kg/day	NA	NA	NA	1.2E-05	mg/kg/day	4.0E-02	mg/kg/day	3.0E-04

TABLE 7.10.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Trespasser
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Site 28 Soil*	Dermal Absorption	Iron	2.2E+04	mg/kg	2.7E-04	mg/kg/day	NA	NA	NA	7.8E-04	mg/kg/day	3.0E-01	mg/kg/day	2.6E-03
				Manganese	2.3E+02	mg/kg	2.8E-06	mg/kg/day	NA	NA	NA	8.1E-06	mg/kg/day	8.0E-04	mg/kg/day	1.0E-02
				Mercury	1.3E+00	mg/kg	1.6E-08	mg/kg/day	NA	NA	NA	4.6E-08	mg/kg/day	2.1E-05	mg/kg/day	2.2E-03
				Nickel	1.4E+01	mg/kg	1.6E-07	mg/kg/day	NA	NA	NA	4.8E-07	mg/kg/day	8.0E-04	mg/kg/day	6.0E-04
				Thallium	4.7E-01	mg/kg	5.6E-09	mg/kg/day	NA	NA	NA	1.6E-08	mg/kg/day	7.0E-05	mg/kg/day	2.3E-04
				Vanadium	2.7E+01	mg/kg	3.2E-07	mg/kg/day	NA	NA	NA	9.2E-07	mg/kg/day	2.6E-05	mg/kg/day	3.6E-02
				Zinc	2.4E+04	mg/kg	2.9E-04	mg/kg/day	NA	NA	NA	8.5E-04	mg/kg/day	3.0E-01	mg/kg/day	2.8E-03
			Exp. Route Total								7.5E-06					1.4E-01
		Exposure Point Total									2.1E-05					2.9E-01
	Exposure Medium Total										2.1E-05					2.9E-01
Soil* Total											2.1E-05					2.9E-01
											Total of Receptor Risks Across All Media	2.1E-05		Total of Receptor Hazards Across All Media		2.9E-01

* Surface and subsurface soil combined.

TABLE 7.11.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Site 28 Soil*	Ingestion	Benzo(a)pyrene	2.9E-01	mg/kg	1.1E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	7.7E-08	8.2E-08	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	3.5E-01	mg/kg	1.3E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	9.3E-09	9.9E-08	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.0E-01	mg/kg	1.1E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	7.9E-08	8.4E-08	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.2E-01	mg/kg	1.1E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	8.3E-09	8.8E-08	mg/kg/day	NA	NA	NA
				n-Nitroso-di-n-propylamine	1.0E-01	mg/kg	3.6E-09	mg/kg/day	7.0E+00	1/(mg/kg-day)	2.5E-08	2.8E-08	mg/kg/day	NA	NA	NA
				Aluminum	6.6E+03	mg/kg	2.4E-04	mg/kg/day	NA	NA	NA	1.8E-03	mg/kg/day	1.0E+00	mg/kg/day	1.8E-03
				Antimony	2.6E+01	mg/kg	9.2E-07	mg/kg/day	NA	NA	NA	7.2E-06	mg/kg/day	4.0E-04	mg/kg/day	1.8E-02
				Arsenic	1.2E+02	mg/kg	4.4E-06	mg/kg/day	1.5E+00	1/(mg/kg-day)	6.7E-06	3.5E-05	mg/kg/day	3.0E-04	mg/kg/day	1.2E-01
				Barium	4.0E+02	mg/kg	1.4E-05	mg/kg/day	NA	NA	NA	1.1E-04	mg/kg/day	7.0E-02	mg/kg/day	1.6E-03
				Cadmium	4.4E+01	mg/kg	1.6E-06	mg/kg/day	NA	NA	NA	1.2E-05	mg/kg/day	1.0E-03	mg/kg/day	1.2E-02
				Chromium	3.2E+01	mg/kg	1.2E-06	mg/kg/day	NA	NA	NA	9.0E-06	mg/kg/day	3.0E-03	mg/kg/day	3.0E-03
				Copper	3.4E+02	mg/kg	1.2E-05	mg/kg/day	NA	NA	NA	9.6E-05	mg/kg/day	4.0E-02	mg/kg/day	2.4E-03
				Iron	2.2E+04	mg/kg	8.1E-04	mg/kg/day	NA	NA	NA	6.3E-03	mg/kg/day	3.0E-01	mg/kg/day	2.1E-02
				Manganese	2.3E+02	mg/kg	8.4E-06	mg/kg/day	NA	NA	NA	6.5E-05	mg/kg/day	2.0E-02	mg/kg/day	3.3E-03
				Mercury	1.3E+00	mg/kg	4.8E-08	mg/kg/day	NA	NA	NA	3.7E-07	mg/kg/day	3.0E-04	mg/kg/day	1.2E-03
				Nickel	1.4E+01	mg/kg	4.9E-07	mg/kg/day	NA	NA	NA	3.8E-06	mg/kg/day	2.0E-02	mg/kg/day	1.9E-04
				Thallium	4.7E-01	mg/kg	1.7E-08	mg/kg/day	NA	NA	NA	1.3E-07	mg/kg/day	7.0E-05	mg/kg/day	1.9E-03
				Vanadium	2.7E+01	mg/kg	9.5E-07	mg/kg/day	NA	NA	NA	7.4E-06	mg/kg/day	1.0E-03	mg/kg/day	7.4E-03
				Zinc	2.4E+04	mg/kg	8.8E-04	mg/kg/day	NA	NA	NA	6.8E-03	mg/kg/day	3.0E-01	mg/kg/day	2.3E-02
			Exp. Route Total								6.9E-06					2.1E-01
			Dermal Absorption	Benzo(a)pyrene	2.9E-01	mg/kg	1.8E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.3E-07	1.4E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	3.5E-01	mg/kg	2.2E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.6E-08	1.7E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	3.0E-01	mg/kg	1.9E-08	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.4E-07	1.4E-07	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	3.2E-01	mg/kg	2.0E-08	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.4E-08	1.5E-07	mg/kg/day	NA	NA	NA
				n-Nitroso-di-n-propylamine	1.0E-01	mg/kg	4.7E-09	mg/kg/day	7.0E+00	1/(mg/kg-day)	3.3E-08	3.7E-08	mg/kg/day	NA	NA	NA
				Aluminum	6.6E+03	mg/kg	3.1E-05	mg/kg/day	NA	NA	NA	2.4E-04	mg/kg/day	1.0E+00	mg/kg/day	2.4E-04
				Antimony	2.6E+01	mg/kg	1.2E-07	mg/kg/day	NA	NA	NA	9.5E-07	mg/kg/day	6.0E-05	mg/kg/day	1.6E-02
				Arsenic	1.2E+02	mg/kg	1.8E-06	mg/kg/day	1.5E+00	1/(mg/kg-day)	2.6E-06	1.4E-05	mg/kg/day	3.0E-04	mg/kg/day	4.6E-02
				Barium	4.0E+02	mg/kg	1.9E-06	mg/kg/day	NA	NA	NA	1.5E-05	mg/kg/day	4.9E-03	mg/kg/day	3.0E-03
				Cadmium	4.4E+01	mg/kg	2.1E-08	mg/kg/day	NA	NA	NA	1.6E-07	mg/kg/day	2.5E-05	mg/kg/day	6.5E-03
				Chromium	3.2E+01	mg/kg	1.5E-07	mg/kg/day	NA	NA	NA	1.2E-06	mg/kg/day	7.5E-05	mg/kg/day	1.6E-02
				Copper	3.4E+02	mg/kg	1.6E-06	mg/kg/day	NA	NA	NA	1.3E-05	mg/kg/day	4.0E-02	mg/kg/day	3.2E-04

TABLE 7.11.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Site 28 Soil*	Dermal Absorption	Iron	2.2E+04	mg/kg	1.1E-04	mg/kg/day	NA	NA	NA	8.3E-04	mg/kg/day	3.0E-01	mg/kg/day	2.8E-03
				Manganese	2.3E+02	mg/kg	1.1E-06	mg/kg/day	NA	NA	NA	8.6E-06	mg/kg/day	8.0E-04	mg/kg/day	1.1E-02
				Mercury	1.3E+00	mg/kg	6.3E-09	mg/kg/day	NA	NA	NA	4.9E-08	mg/kg/day	2.1E-05	mg/kg/day	2.3E-03
				Nickel	1.4E+01	mg/kg	6.5E-08	mg/kg/day	NA	NA	NA	5.1E-07	mg/kg/day	8.0E-04	mg/kg/day	6.3E-04
				Thallium	4.7E-01	mg/kg	2.2E-09	mg/kg/day	NA	NA	NA	1.7E-08	mg/kg/day	7.0E-05	mg/kg/day	2.5E-04
				Vanadium	2.7E+01	mg/kg	1.3E-07	mg/kg/day	NA	NA	NA	9.8E-07	mg/kg/day	2.6E-05	mg/kg/day	3.8E-02
				Zinc	2.4E+04	mg/kg	1.2E-04	mg/kg/day	NA	NA	NA	9.0E-04	mg/kg/day	3.0E-01	mg/kg/day	3.0E-03
			Exp. Route Total								3.0E-06					1.4E-01
		Exposure Point Total									9.8E-06					3.6E-01
	Exposure Medium Total										9.8E-06					3.6E-01
Medium Total											9.8E-06					3.6E-01
											Total of Receptor Risks Across All Media	9.8E-06				Total of Receptor Hazards Across All Media	3.6E-01

* Surface and subsurface soil combined.

TABLE 7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Site 28 Soil*	Ingestion	Benzo(a)pyrene	1.7E-01	mg/kg	NA	NA	7.3E+00	1/(mg/kg-day)	NA	7.7E-08	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	1.7E-01	mg/kg	NA	NA	7.3E-01	1/(mg/kg-day)	NA	7.9E-08	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	2.3E-01	mg/kg	NA	NA	7.3E+00	1/(mg/kg-day)	NA	1.0E-07	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	1.7E-01	mg/kg	NA	NA	7.3E-01	1/(mg/kg-day)	NA	8.0E-08	mg/kg/day	NA	NA	NA
				n-Nitroso-di-n-propylamine	1.0E-01	mg/kg	NA	NA	7.0E+00	1/(mg/kg-day)	NA	4.6E-08	mg/kg/day	NA	NA	NA
				Aluminum	5.0E+03	mg/kg	NA	NA	NA	NA	NA	2.3E-03	mg/kg/day	1.0E+00	mg/kg/day	2.3E-03
				Antimony	4.1E-01	mg/kg	NA	NA	NA	NA	NA	1.9E-07	mg/kg/day	4.0E-04	mg/kg/day	4.7E-04
				Arsenic	1.5E+01	mg/kg	NA	NA	1.5E+00	1/(mg/kg-day)	NA	7.0E-06	mg/kg/day	3.0E-04	mg/kg/day	2.3E-02
				Barium	4.9E+01	mg/kg	NA	NA	NA	NA	NA	2.2E-05	mg/kg/day	7.0E-02	mg/kg/day	3.2E-04
				Cadmium	1.6E+00	mg/kg	NA	NA	NA	NA	NA	7.2E-07	mg/kg/day	1.0E-03	mg/kg/day	7.2E-04
				Chromium	9.7E+00	mg/kg	NA	NA	NA	NA	NA	4.5E-06	mg/kg/day	3.0E-03	mg/kg/day	1.5E-03
				Copper	1.9E+01	mg/kg	NA	NA	NA	NA	NA	8.9E-06	mg/kg/day	4.0E-02	mg/kg/day	2.2E-04
				Iron	1.1E+04	mg/kg	NA	NA	NA	NA	NA	5.1E-03	mg/kg/day	3.0E-01	mg/kg/day	1.7E-02
				Manganese	6.8E+01	mg/kg	NA	NA	NA	NA	NA	3.1E-05	mg/kg/day	2.0E-02	mg/kg/day	1.6E-03
				Mercury	6.0E-02	mg/kg	NA	NA	NA	NA	NA	2.7E-08	mg/kg/day	3.0E-04	mg/kg/day	9.1E-05
				Nickel	5.4E+00	mg/kg	NA	NA	NA	NA	NA	2.5E-06	mg/kg/day	2.0E-02	mg/kg/day	1.2E-04
				Thallium	3.6E-01	mg/kg	NA	NA	NA	NA	NA	1.7E-07	mg/kg/day	7.0E-05	mg/kg/day	2.4E-03
				Vanadium	1.9E+01	mg/kg	NA	NA	NA	NA	NA	8.5E-06	mg/kg/day	1.0E-03	mg/kg/day	8.5E-03
				Zinc	4.9E+02	mg/kg	NA	NA	NA	NA	NA	2.3E-04	mg/kg/day	3.0E-01	mg/kg/day	7.5E-04
			Exp. Route Total								0.0E+00					5.9E-02
			Dermal	Benzo(a)pyrene	1.7E-01	mg/kg	NA	NA	7.3E+00	1/(mg/kg-day)	NA	8.0E-08	mg/kg/day	NA	NA	NA
			Absorption	Benzo(b)fluoranthene	1.7E-01	mg/kg	NA	NA	7.3E-01	1/(mg/kg-day)	NA	8.1E-08	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	2.3E-01	mg/kg	NA	NA	7.3E+00	1/(mg/kg-day)	NA	1.1E-07	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	1.7E-01	mg/kg	NA	NA	7.3E-01	1/(mg/kg-day)	NA	8.3E-08	mg/kg/day	NA	NA	NA
				n-Nitroso-di-n-propylamine	1.0E-01	mg/kg	NA	NA	7.0E+00	1/(mg/kg-day)	NA	3.7E-08	mg/kg/day	NA	NA	NA
				Aluminum	5.0E+03	mg/kg	NA	NA	NA	NA	NA	1.8E-04	mg/kg/day	1.0E+00	mg/kg/day	1.8E-04
				Antimony	4.1E-01	mg/kg	NA	NA	NA	NA	NA	1.5E-08	mg/kg/day	6.0E-05	mg/kg/day	2.5E-04
				Arsenic	1.5E+01	mg/kg	NA	NA	1.5E+00	1/(mg/kg-day)	NA	1.7E-06	mg/kg/day	3.0E-04	mg/kg/day	5.6E-03
				Barium	4.9E+01	mg/kg	NA	NA	NA	NA	NA	1.8E-06	mg/kg/day	4.9E-03	mg/kg/day	3.6E-04
				Cadmium	1.6E+00	mg/kg	NA	NA	NA	NA	NA	5.7E-09	mg/kg/day	2.5E-05	mg/kg/day	2.3E-04
				Chromium	9.7E+00	mg/kg	NA	NA	NA	NA	NA	3.6E-07	mg/kg/day	7.5E-05	mg/kg/day	4.8E-03
				Copper	1.9E+01	mg/kg	NA	NA	NA	NA	NA	7.1E-07	mg/kg/day	4.0E-02	mg/kg/day	1.8E-05

TABLE 7.1.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Site 28 Soil*	Dermal	Iron	1.1E+04	mg/kg	NA	NA	NA	NA	NA	4.1E-04	mg/kg/day	3.0E-01	mg/kg/day	1.4E-03
			Absorption	Manganese	6.8E+01	mg/kg	NA	NA	NA	NA	NA	2.5E-06	mg/kg/day	8.0E-04	mg/kg/day	3.1E-03
				Mercury	6.0E-02	mg/kg	NA	NA	NA	NA	NA	2.2E-09	mg/kg/day	2.1E-05	mg/kg/day	1.0E-04
				Nickel	5.4E+00	mg/kg	NA	NA	NA	NA	NA	2.0E-07	mg/kg/day	8.0E-04	mg/kg/day	2.5E-04
				Thallium	3.6E-01	mg/kg	NA	NA	NA	NA	NA	1.3E-08	mg/kg/day	7.0E-05	mg/kg/day	1.9E-04
				Vanadium	1.9E+01	mg/kg	NA	NA	NA	NA	NA	6.8E-07	mg/kg/day	2.6E-05	mg/kg/day	2.6E-02
				Zinc	4.9E+02	mg/kg	NA	NA	NA	NA	NA	1.8E-05	mg/kg/day	3.0E-01	mg/kg/day	6.0E-05
			Exp. Route Total								0.0E+00					4.3E-02
		Exposure Point Total									0.0E+00					1.0E-01
	Exposure Medium Total										0.0E+00					1.0E-01
Soil* Total											0.0E+00					1.0E-01
Groundwater	Groundwater	Tap Water	Ingestion	bis(2-Ethylhexyl)phthalate	6.4E+01	ug/l	NA	NA	1.4E-02	1/(mg/kg-day)	NA	8.2E-04	mg/kg/day	2.0E-02	mg/kg/day	4.1E-02
				Aluminum	8.2E+03	ug/l	NA	NA	NA	NA	NA	1.1E-01	mg/kg/day	1.0E+00	mg/kg/day	1.1E-01
				Antimony	1.2E+00	ug/l	NA	NA	NA	NA	NA	1.5E-05	mg/kg/day	6.0E-05	mg/kg/day	2.5E-01
				Arsenic	1.2E+02	ug/l	NA	NA	1.5E+00	1/(mg/kg-day)	NA	1.6E-03	mg/kg/day	3.0E-04	mg/kg/day	5.2E+00
				Cadmium	1.0E+00	ug/l	NA	NA	NA	NA	NA	1.3E-05	mg/kg/day	5.0E-04	mg/kg/day	2.6E-02
				Chromium	1.4E+01	ug/l	NA	NA	NA	NA	NA	1.8E-04	mg/kg/day	3.0E-03	mg/kg/day	5.9E-02
				Iron	1.5E+04	ug/l	NA	NA	NA	NA	NA	1.9E-01	mg/kg/day	3.0E-01	mg/kg/day	6.4E-01
				Manganese	3.6E+02	ug/l	NA	NA	NA	NA	NA	4.7E-03	mg/kg/day	2.0E-02	mg/kg/day	2.3E-01
				Vanadium	2.4E+01	ug/l	NA	NA	NA	NA	NA	3.1E-04	mg/kg/day	1.0E-03	mg/kg/day	3.1E-01
				Zinc	8.1E+02	ug/l	NA	NA	NA	NA	NA	1.0E-02	mg/kg/day	3.0E-01	mg/kg/day	3.5E-02
			Exp. Route Total								0.0E+00					6.9E+00
			Dermal	bis(2-Ethylhexyl)phthalate	6.4E+01	ug/l	NA	NA	1.4E-02	1/(mg/kg-day)	NA	1.2E-03	mg/kg/day	2.0E-02	mg/kg/day	5.9E-02
				Aluminum	8.2E+03	ug/l	NA	NA	NA	NA	NA	3.4E-04	mg/kg/day	1.0E+00	mg/kg/day	3.4E-04
				Antimony	1.2E+00	ug/l	NA	NA	NA	NA	NA	4.9E-08	mg/kg/day	6.0E-05	mg/kg/day	8.1E-04
				Arsenic	1.2E+02	ug/l	NA	NA	1.5E+00	1/(mg/kg-day)	NA	5.1E-06	mg/kg/day	3.0E-04	mg/kg/day	1.7E-02
				Cadmium	1.0E+00	ug/l	NA	NA	NA	NA	NA	4.2E-08	mg/kg/day	2.5E-05	mg/kg/day	1.7E-03
				Chromium	1.4E+01	ug/l	NA	NA	NA	NA	NA	1.1E-06	mg/kg/day	7.5E-05	mg/kg/day	1.5E-02
				Iron	1.5E+04	ug/l	NA	NA	NA	NA	NA	6.1E-04	mg/kg/day	3.0E-01	mg/kg/day	2.0E-03
				Manganese	3.6E+02	ug/l	NA	NA	NA	NA	NA	1.5E-05	mg/kg/day	8.0E-04	mg/kg/day	1.9E-02
				Vanadium	2.4E+01	ug/l	NA	NA	NA	NA	NA	9.8E-07	mg/kg/day	1.0E-03	mg/kg/day	9.8E-04
				Zinc	8.1E+02	ug/l	NA	NA	NA	NA	NA	2.0E-05	mg/kg/day	3.0E-01	mg/kg/day	6.7E-05
			Exp. Route Total								0.0E+00					1.2E-01
		Exposure Point Total									0.0E+00					7.0E+00
	Exposure Medium Total										0.0E+00					7.0E+00
Groundwater Total											0.0E+00					7.0E+00
											Total of Receptor Risks Across All Media					Total of Receptor Hazards Across All Media
											0.0E+00					7.1E+00

* Surface and subsurface soil combined.

Table 7.1.CTE Supplement A
Calculation of DAevent
Resident Adult, Groundwater
Site 28 IHDIV-NSWC
Indian Head, Maryland

Chemical of Potential Concern	Groundwater Concentration (CW) (µg/L)	Permeability Coefficient (Kp) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
bis(2-Ethylhexyl)phthalat	6.4E+01	2.5E-02	2.0E-01	1.7E+01	4.0E+01	8.0E-01	0.25	7.2E-06	2
Aluminum	8.2E+03	1.0E-03	NA	NA	NA	NA	0.25	2.1E-06	1
Antimony	1.2E+00	1.0E-03	NA	NA	NA	NA	0.25	2.9E-10	1
Arsenic	1.2E+02	1.0E-03	NA	NA	NA	NA	0.25	3.1E-08	1
Cadmium	1.0E+00	1.0E-03	NA	NA	NA	NA	0.25	2.6E-10	1
Chromium	1.4E+01	2.0E-03	NA	NA	NA	NA	0.25	6.9E-09	1
Iron	1.5E+04	1.0E-03	NA	NA	NA	NA	0.25	3.7E-06	1
Manganese	3.6E+02	1.0E-03	NA	NA	NA	NA	0.25	9.1E-08	1
Vanadium	2.4E+01	1.0E-03	NA	NA	NA	NA	0.25	6.0E-09	1
Zinc	8.1E+02	6.0E-04	NA	NA	NA	NA	0.25	1.2E-07	1

Inorganics: DAevent (mg/cm2-event) =

Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =

$$\text{If } t_{event} \le t^*, \text{then } DA_{event} = 2 \times FA \times K_p \times C_w \sqrt{\frac{6 \times \tau_{event} \times t_{event}}{\pi}} \qquad \text{(eq 2)}$$

$$\text{If } t_{event} \ge t^*, \text{then } DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2 \times \tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right] \qquad \text{(eq 3)}$$

Notes:

Permeability constants from EPA 2001, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Interim).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.

NA - not applicable.

TABLE 7.2.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Site 28 Soil*	Ingestion	Benzo(a)pyrene	1.7E-01	mg/kg	NA	NA	7.3E+00	1/(mg/kg-day)	NA	7.2E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	1.7E-01	mg/kg	NA	NA	7.3E-01	1/(mg/kg-day)	NA	7.3E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	2.3E-01	mg/kg	NA	NA	7.3E+00	1/(mg/kg-day)	NA	9.6E-07	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	1.7E-01	mg/kg	NA	NA	7.3E-01	1/(mg/kg-day)	NA	7.5E-07	mg/kg/day	NA	NA	NA
				n-Nitroso-di-n-propylamine	1.0E-01	mg/kg	NA	NA	7.0E+00	1/(mg/kg-day)	NA	4.3E-07	mg/kg/day	NA	NA	NA
				Aluminum	5.0E+03	mg/kg	NA	NA	NA	NA	NA	2.1E-02	mg/kg/day	1.0E+00	mg/kg/day	2.1E-02
				Antimony	4.1E-01	mg/kg	NA	NA	NA	NA	NA	1.8E-06	mg/kg/day	4.0E-04	mg/kg/day	4.4E-03
				Arsenic	1.5E+01	mg/kg	NA	NA	1.5E+00	1/(mg/kg-day)	NA	6.5E-05	mg/kg/day	3.0E-04	mg/kg/day	2.2E-01
				Barium	4.9E+01	mg/kg	NA	NA	NA	NA	NA	2.1E-04	mg/kg/day	7.0E-02	mg/kg/day	3.0E-03
				Cadmium	1.6E+00	mg/kg	NA	NA	NA	NA	NA	6.7E-06	mg/kg/day	1.0E-03	mg/kg/day	6.7E-03
				Chromium	9.7E+00	mg/kg	NA	NA	NA	NA	NA	4.2E-05	mg/kg/day	3.0E-03	mg/kg/day	1.4E-02
				Copper	1.9E+01	mg/kg	NA	NA	NA	NA	NA	8.3E-05	mg/kg/day	4.0E-02	mg/kg/day	2.1E-03
				Iron	1.1E+04	mg/kg	NA	NA	NA	NA	NA	4.8E-02	mg/kg/day	3.0E-01	mg/kg/day	1.6E-01
				Manganese	6.8E+01	mg/kg	NA	NA	NA	NA	NA	2.9E-04	mg/kg/day	2.0E-02	mg/kg/day	1.5E-02
				Mercury	6.0E-02	mg/kg	NA	NA	NA	NA	NA	2.5E-07	mg/kg/day	3.0E-04	mg/kg/day	8.5E-04
				Nickel	5.4E+00	mg/kg	NA	NA	NA	NA	NA	2.3E-05	mg/kg/day	2.0E-02	mg/kg/day	1.2E-03
				Thallium	3.6E-01	mg/kg	NA	NA	NA	NA	NA	1.5E-06	mg/kg/day	7.0E-05	mg/kg/day	2.2E-02
				Vanadium	1.9E+01	mg/kg	NA	NA	NA	NA	NA	8.0E-05	mg/kg/day	1.0E-03	mg/kg/day	8.0E-02
				Zinc	4.9E+02	mg/kg	NA	NA	NA	NA	NA	2.1E-03	mg/kg/day	3.0E-01	mg/kg/day	7.0E-03
			Exp. Route Total								0.0E+00					5.5E-01
			Dermal	Benzo(a)pyrene	1.7E-01	mg/kg	NA	NA	7.3E+00	1/(mg/kg-day)	NA	5.2E-07	mg/kg/day	NA	NA	NA
			Absorption	Benzo(b)fluoranthene	1.7E-01	mg/kg	NA	NA	7.3E-01	1/(mg/kg-day)	NA	5.3E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	2.3E-01	mg/kg	NA	NA	7.3E+00	1/(mg/kg-day)	NA	7.0E-07	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	1.7E-01	mg/kg	NA	NA	7.3E-01	1/(mg/kg-day)	NA	5.4E-07	mg/kg/day	NA	NA	NA
				n-Nitroso-di-n-propylamine	1.0E-01	mg/kg	NA	NA	7.0E+00	1/(mg/kg-day)	NA	2.4E-07	mg/kg/day	NA	NA	NA
				Aluminum	5.0E+03	mg/kg	NA	NA	NA	NA	NA	1.2E-03	mg/kg/day	1.0E+00	mg/kg/day	1.2E-03
				Antimony	4.1E-01	mg/kg	NA	NA	NA	NA	NA	9.8E-08	mg/kg/day	6.0E-05	mg/kg/day	1.6E-03
				Arsenic	1.5E+01	mg/kg	NA	NA	1.5E+00	1/(mg/kg-day)	NA	1.1E-05	mg/kg/day	3.0E-04	mg/kg/day	3.6E-02
				Barium	4.9E+01	mg/kg	NA	NA	NA	NA	NA	1.2E-05	mg/kg/day	4.9E-03	mg/kg/day	2.4E-03
				Cadmium	1.6E+00	mg/kg	NA	NA	NA	NA	NA	3.8E-08	mg/kg/day	2.5E-05	mg/kg/day	1.5E-03
				Chromium	9.7E+00	mg/kg	NA	NA	NA	NA	NA	2.3E-06	mg/kg/day	7.5E-05	mg/kg/day	3.1E-02
				Copper	1.9E+01	mg/kg	NA	NA	NA	NA	NA	4.6E-06	mg/kg/day	4.0E-02	mg/kg/day	1.2E-04

TABLE 7.2.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Site 28 Soil*	Dermal	Iron	1.1E+04	mg/kg	NA	NA	NA	NA	NA	2.7E-03	mg/kg/day	3.0E-01	mg/kg/day	8.9E-03
			Absorption	Manganese	6.8E+01	mg/kg	NA	NA	NA	NA	NA	1.6E-05	mg/kg/day	8.0E-04	mg/kg/day	2.0E-02
				Mercury	6.0E-02	mg/kg	NA	NA	NA	NA	NA	1.4E-08	mg/kg/day	2.1E-05	mg/kg/day	6.8E-04
				Nickel	5.4E+00	mg/kg	NA	NA	NA	NA	NA	1.3E-06	mg/kg/day	8.0E-04	mg/kg/day	1.6E-03
				Thallium	3.6E-01	mg/kg	NA	NA	NA	NA	NA	8.6E-08	mg/kg/day	7.0E-05	mg/kg/day	1.2E-03
				Vanadium	1.9E+01	mg/kg	NA	NA	NA	NA	NA	4.5E-06	mg/kg/day	2.6E-05	mg/kg/day	1.7E-01
				Zinc	4.9E+02	mg/kg	NA	NA	NA	NA	NA	1.2E-04	mg/kg/day	3.0E-01	mg/kg/day	3.9E-04
			Exp. Route Total								0.0E+00					2.8E-01
		Exposure Point Total									0.0E+00					8.3E-01
	Exposure Medium Total										0.0E+00					8.3E-01
Soil* Total											0.0E+00					8.3E-01
Groundwater	Groundwater	Tap Water	Ingestion	bis(2-Ethylhexyl)phthalate	6.4E+01	ug/l	NA	NA	1.4E-02	1/(mg/kg-day)	NA	2.0E-03	mg/kg/day	2.0E-02	mg/kg/day	1.0E-01
				Aluminum	8.2E+03	ug/l	NA	NA	NA	NA	NA	2.6E-01	mg/kg/day	1.0E+00	mg/kg/day	2.6E-01
				Antimony	1.2E+00	ug/l	NA	NA	NA	NA	NA	3.7E-05	mg/kg/day	4.0E-04	mg/kg/day	9.3E-02
				Arsenic	1.2E+02	ug/l	NA	NA	1.5E+00	1/(mg/kg-day)	NA	3.9E-03	mg/kg/day	3.0E-04	mg/kg/day	1.3E+01
				Cadmium	1.0E+00	ug/l	NA	NA	NA	NA	NA	3.2E-05	mg/kg/day	5.0E-04	mg/kg/day	6.5E-02
				Chromium	1.4E+01	ug/l	NA	NA	NA	NA	NA	4.3E-04	mg/kg/day	3.0E-03	mg/kg/day	1.4E-01
				Iron	1.5E+04	ug/l	NA	NA	NA	NA	NA	4.7E-01	mg/kg/day	3.0E-01	mg/kg/day	1.6E+00
				Manganese	3.6E+02	ug/l	NA	NA	NA	NA	NA	1.2E-02	mg/kg/day	2.0E-02	mg/kg/day	5.8E-01
				Vanadium	2.4E+01	ug/l	NA	NA	NA	NA	NA	7.6E-04	mg/kg/day	1.0E-03	mg/kg/day	7.6E-01
				Zinc	8.1E+02	ug/l	NA	NA	NA	NA	NA	2.6E-02	mg/kg/day	3.0E-01	mg/kg/day	8.6E-02
			Exp. Route Total								0.0E+00					1.7E+01
			Dermal	bis(2-Ethylhexyl)phthalate	6.4E+01	ug/l	NA	NA	1.4E-02	1/(mg/kg-day)	NA	2.3E-03	mg/kg/day	2.0E-02	mg/kg/day	1.2E-01
				Aluminum	8.2E+03	ug/l	NA	NA	NA	NA	NA	7.7E-04	mg/kg/day	1.0E+00	mg/kg/day	7.7E-04
				Antimony	1.2E+00	ug/l	NA	NA	NA	NA	NA	1.1E-07	mg/kg/day	6.0E-05	mg/kg/day	1.8E-03
				Arsenic	1.2E+02	ug/l	NA	NA	1.5E+00	1/(mg/kg-day)	NA	1.1E-05	mg/kg/day	3.0E-04	mg/kg/day	3.8E-02
				Cadmium	1.0E+00	ug/l	NA	NA	NA	NA	NA	9.6E-08	mg/kg/day	2.5E-05	mg/kg/day	3.8E-03
				Chromium	1.4E+01	ug/l	NA	NA	NA	NA	NA	2.6E-06	mg/kg/day	7.5E-05	mg/kg/day	3.4E-02
				Iron	1.5E+04	ug/l	NA	NA	NA	NA	NA	1.4E-03	mg/kg/day	3.0E-01	mg/kg/day	4.6E-03
				Manganese	3.6E+02	ug/l	NA	NA	NA	NA	NA	3.4E-05	mg/kg/day	8.0E-04	mg/kg/day	4.2E-02
				Vanadium	2.4E+01	ug/l	NA	NA	NA	NA	NA	2.2E-06	mg/kg/day	2.6E-05	mg/kg/day	8.6E-02
				Zinc	8.1E+02	ug/l	NA	NA	NA	NA	NA	4.5E-05	mg/kg/day	3.0E-01	mg/kg/day	1.5E-04
			Exp. Route Total								0.0E+00					3.3E-01
		Exposure Point Total									0.0E+00					1.7E+01
	Exposure Medium Total										0.0E+00					1.7E+01
Groundwater Total											0.0E+00					1.7E+01
											Total of Receptor Risks Across All Media					0.0E+00					Total of Receptor Hazards Across All Media					1.8E+01

* Surface and subsurface soil combined.

Table 7.2 Supplement
Calculation of DAevent
Resident Child, Groundwater
Site 28 IHDIV-NSWC
Indian Head, Maryland

Chemical of Potential Concern	Groundwater Concentration (CW) (µg/L)	Permeability Coefficient (Kp) (cm/hr)	B dimensionless	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
bis(2-Ethylhexyl)phthalat	6.4E+01	2.5E-02	2.0E-01	1.7E+01	4.0E+01	8.0E-01	0.33	8.2E-06	2
Aluminum	8.2E+03	1.0E-03	NA	NA	NA	NA	0.33	2.7E-06	1
Antimony	1.2E+00	1.0E-03	NA	NA	NA	NA	0.33	3.9E-10	1
Arsenic	1.2E+02	1.0E-03	NA	NA	NA	NA	0.33	4.0E-08	1
Cadmium	1.0E+00	1.0E-03	NA	NA	NA	NA	0.33	3.4E-10	1
Chromium	1.4E+01	2.0E-03	NA	NA	NA	NA	0.33	9.0E-09	1
Iron	1.5E+04	1.0E-03	NA	NA	NA	NA	0.33	4.9E-06	1
Manganese	3.6E+02	1.0E-03	NA	NA	NA	NA	0.33	1.2E-07	1
Vanadium	2.4E+01	1.0E-03	NA	NA	NA	NA	0.33	7.9E-09	1
Zinc	8.1E+02	6.0E-04	NA	NA	NA	NA	0.33	1.6E-07	1

Inorganics: DAevent (mg/cm2-event) =
Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =

$$\text{If } t_{event} \le t^*, \text{then } DA_{event} = 2 \times FA \times K_p \times C_w \sqrt{\frac{6 \times \tau_{event} \times t_{event}}{\pi}}$$

$$\text{If } t_{event} \ge t^*, \text{then } DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2 \times \tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right]$$

Notes:
Permeability constants from EPA 2001, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Interim).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.
NA - not applicable.

TABLE 7.3.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Site 28 Soil*	Ingestion	Benzo(a)pyrene	1.7E-01	mg/kg	7.2E-08	NA	7.3E+00	1/(mg/kg-day)	5.2E-07	NA	NA	NA	NA	NA
				Benzo(b)fluoranthene	1.7E-01	mg/kg	7.3E-08	NA	7.3E-01	1/(mg/kg-day)	5.3E-08	NA	NA	NA	NA	NA
				Dibenz(a,h)anthracene	2.3E-01	mg/kg	9.6E-08	NA	7.3E+00	1/(mg/kg-day)	7.0E-07	NA	NA	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	1.7E-01	mg/kg	7.4E-08	NA	7.3E-01	1/(mg/kg-day)	5.4E-08	NA	NA	NA	NA	NA
				n-Nitroso-di-n-propylamine	1.0E-01	mg/kg	4.3E-08	NA	7.0E+00	1/(mg/kg-day)	3.0E-07	NA	NA	NA	NA	NA
				Aluminum	5.0E+03	mg/kg	2.1E-03	NA	NA	NA	NA	NA	NA	1.0E+00	mg/kg/day	NA
				Antimony	4.1E-01	mg/kg	1.7E-07	NA	NA	NA	NA	NA	NA	4.0E-04	mg/kg/day	NA
				Arsenic	1.5E+01	mg/kg	6.5E-06	NA	1.5E+00	1/(mg/kg-day)	9.7E-06	NA	NA	3.0E-04	mg/kg/day	NA
				Barium	4.9E+01	mg/kg	2.1E-05	NA	NA	NA	NA	NA	NA	7.0E-02	mg/kg/day	NA
				Cadmium	1.6E+00	mg/kg	6.7E-07	NA	NA	NA	NA	NA	NA	1.0E-03	mg/kg/day	NA
				Chromium	9.7E+00	mg/kg	4.1E-06	NA	NA	NA	NA	NA	NA	3.0E-03	mg/kg/day	NA
				Copper	1.9E+01	mg/kg	8.2E-06	NA	NA	NA	NA	NA	NA	4.0E-02	mg/kg/day	NA
				Iron	1.1E+04	mg/kg	4.8E-03	NA	NA	NA	NA	NA	NA	3.0E-01	mg/kg/day	NA
				Manganese	6.8E+01	mg/kg	2.9E-05	NA	NA	NA	NA	NA	NA	2.0E-02	mg/kg/day	NA
				Mercury	6.0E-02	mg/kg	2.5E-08	NA	NA	NA	NA	NA	NA	3.0E-04	mg/kg/day	NA
				Nickel	5.4E+00	mg/kg	2.3E-06	NA	NA	NA	NA	NA	NA	2.0E-02	mg/kg/day	NA
				Thallium	3.6E-01	mg/kg	1.5E-07	NA	NA	NA	NA	NA	NA	7.0E-05	mg/kg/day	NA
				Vanadium	1.9E+01	mg/kg	7.9E-06	NA	NA	NA	NA	NA	NA	1.0E-03	mg/kg/day	NA
				Zinc	4.9E+02	mg/kg	2.1E-04	NA	NA	NA	NA	NA	NA	3.0E-01	mg/kg/day	NA
			Exp. Route Total								1.1E-05					0.0E+00
			Dermal	Benzo(a)pyrene	1.7E-01	mg/kg	5.5E-08	NA	7.3E+00	1/(mg/kg-day)	4.0E-07	NA	NA	NA	NA	NA
			Absorption	Benzo(b)fluoranthene	1.7E-01	mg/kg	5.6E-08	NA	7.3E-01	1/(mg/kg-day)	4.1E-08	NA	NA	NA	NA	NA
				Dibenz(a,h)anthracene	2.3E-01	mg/kg	7.4E-08	NA	7.3E+00	1/(mg/kg-day)	5.4E-07	NA	NA	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	1.7E-01	mg/kg	5.7E-08	NA	7.3E-01	1/(mg/kg-day)	4.2E-08	NA	NA	NA	NA	NA
				n-Nitroso-di-n-propylamine	1.0E-01	mg/kg	2.5E-08	NA	7.0E+00	1/(mg/kg-day)	1.8E-07	NA	NA	NA	NA	NA
				Aluminum	5.0E+03	mg/kg	1.3E-04	NA	NA	NA	NA	NA	NA	1.0E+00	mg/kg/day	NA
				Antimony	4.1E-01	mg/kg	1.0E-08	NA	NA	NA	NA	NA	NA	6.0E-05	mg/kg/day	NA
				Arsenic	1.5E+01	mg/kg	1.2E-06	NA	1.5E+00	1/(mg/kg-day)	1.7E-06	NA	NA	3.0E-04	mg/kg/day	NA
				Barium	4.9E+01	mg/kg	1.2E-06	NA	NA	NA	NA	NA	NA	4.9E-03	mg/kg/day	NA
				Cadmium	1.6E+00	mg/kg	4.0E-09	NA	NA	NA	NA	NA	NA	2.5E-05	mg/kg/day	NA
				Chromium	9.7E+00	mg/kg	2.5E-07	NA	NA	NA	NA	NA	NA	7.5E-05	mg/kg/day	NA
				Copper	1.9E+01	mg/kg	4.9E-07	NA	NA	NA	NA	NA	NA	4.0E-02	mg/kg/day	NA

TABLE 7.3 CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Site 28 Soil*	Dermal	Iron	1.1E+04	mg/kg	2.8E-04	NA	NA	NA	NA	NA	NA	3.0E-01	mg/kg/day	NA
			Absorption	Manganese	6.8E+01	mg/kg	1.7E-06	NA	NA	NA	NA	NA	NA	8.0E-04	mg/kg/day	NA
				Mercury	6.0E-02	mg/kg	1.5E-09	NA	NA	NA	NA	NA	NA	2.1E-05	mg/kg/day	NA
				Nickel	5.4E+00	mg/kg	1.4E-07	NA	NA	NA	NA	NA	NA	8.0E-04	mg/kg/day	NA
				Thallium	3.6E-01	mg/kg	9.1E-09	NA	NA	NA	NA	NA	NA	7.0E-05	mg/kg/day	NA
				Vanadium	1.9E+01	mg/kg	4.7E-07	NA	NA	NA	NA	NA	NA	2.6E-05	mg/kg/day	NA
				Zinc	4.9E+02	mg/kg	1.2E-05	NA	NA	NA	NA	NA	NA	3.0E-01	mg/kg/day	NA
			Exp. Route Total								2.9E-06					0.0E+00
		Exposure Point Total									1.4E-05					0.0E+00
	Exposure Medium Total										1.4E-05					0.0E+00
Soil* Total											1.4E-05					0.0E+00
Groundwater	Groundwater	Tap Water	Ingestion	bis(2-Ethylhexyl)phthalate	6.4E+01	ug/l	2.8E-04	NA	1.4E-02	1/(mg/kg-day)	3.9E-06	NA	NA	2.0E-02	mg/kg/day	NA
				Aluminum	8.2E+03	ug/l	3.6E-02	NA	NA	NA	NA	NA	NA	1.0E+00	mg/kg/day	NA
				Antimony	1.2E+00	ug/l	5.2E-06	NA	NA	NA	NA	NA	NA	4.0E-04	mg/kg/day	NA
				Arsenic	1.2E+02	ug/l	5.4E-04	NA	1.5E+00	1/(mg/kg-day)	8.1E-04	NA	NA	3.0E-04	mg/kg/day	NA
				Cadmium	1.0E+00	ug/l	4.5E-06	NA	NA	NA	NA	NA	NA	5.0E-04	mg/kg/day	NA
				Chromium	1.4E+01	ug/l	6.0E-05	NA	NA	NA	NA	NA	NA	3.0E-03	mg/kg/day	NA
				Iron	1.5E+04	ug/l	6.5E-02	NA	NA	NA	NA	NA	NA	3.0E-01	mg/kg/day	NA
				Manganese	3.6E+02	ug/l	1.6E-03	NA	NA	NA	NA	NA	NA	2.0E-02	mg/kg/day	NA
				Vanadium	2.4E+01	ug/l	1.1E-04	NA	NA	NA	NA	NA	NA	1.0E-03	mg/kg/day	NA
				Zinc	8.1E+02	ug/l	3.6E-03	NA	NA	NA	NA	NA	NA	3.0E-01	mg/kg/day	NA
			Exp. Route Total								8.1E-04					0.0E+00
			Dermal	bis(2-Ethylhexyl)phthalate	6.4E+01	ug/l	3.5E-04	NA	1.4E-02	1/(mg/kg-day)	4.9E-06	NA	NA	2.0E-02	mg/kg/day	NA
				Aluminum	8.2E+03	ug/l	1.1E-04	NA	NA	NA	NA	NA	NA	1.0E+00	mg/kg/day	NA
				Antimony	1.2E+00	ug/l	1.6E-08	NA	NA	NA	NA	NA	NA	6.0E-05	mg/kg/day	NA
				Arsenic	1.2E+02	ug/l	1.6E-06	NA	1.5E+00	1/(mg/kg-day)	2.4E-06	NA	NA	3.0E-04	mg/kg/day	NA
				Cadmium	1.0E+00	ug/l	1.4E-08	NA	NA	NA	NA	NA	NA	2.5E-05	mg/kg/day	NA
				Chromium	1.4E+01	ug/l	3.6E-07	NA	NA	NA	NA	NA	NA	7.5E-05	mg/kg/day	NA
				Iron	1.5E+04	ug/l	2.0E-04	NA	NA	NA	NA	NA	NA	3.0E-01	mg/kg/day	NA
				Manganese	3.6E+02	ug/l	4.8E-06	NA	NA	NA	NA	NA	NA	8.0E-04	mg/kg/day	NA
				Vanadium	2.4E+01	ug/l	3.2E-07	NA	NA	NA	NA	NA	NA	2.6E-05	mg/kg/day	NA
				Zinc	8.1E+02	ug/l	6.5E-06	NA	NA	NA	NA	NA	NA	3.0E-01	mg/kg/day	NA
			Exp. Route Total								7.4E-06					0.0E+00
		Exposure Point Total									8.2E-04					0.0E+00
	Exposure Medium Total										8.2E-04					0.0E+00
Groundwater Total											8.2E-04					0.0E+00
											Total of Receptor Risks Across All Media					Total of Receptor Hazards Across All Media
											8.3E-04					0.0E+00

* Surface and subsurface soil combined.

TABLE 7.4.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Site 28 Soil*	Ingestion	Benzo(a)pyrene	1.7E-01	mg/kg	2.1E-09	mg/kg/day	7.3E+00	1/(mg/kg-day)	1.5E-08	1.4E-07	mg/kg/day	NA	NA	NA
				Benzo(b)fluoranthene	1.7E-01	mg/kg	2.1E-09	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.5E-09	1.5E-07	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	2.3E-01	mg/kg	2.8E-09	mg/kg/day	7.3E+00	1/(mg/kg-day)	2.0E-08	1.9E-07	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	1.7E-01	mg/kg	2.1E-09	mg/kg/day	7.3E-01	1/(mg/kg-day)	1.6E-09	1.5E-07	mg/kg/day	NA	NA	NA
				n-Nitroso-di-n-propylamine	1.0E-01	mg/kg	1.2E-09	mg/kg/day	7.0E+00	1/(mg/kg-day)	8.6E-09	8.6E-08	mg/kg/day	NA	NA	NA
				Aluminum	5.0E+03	mg/kg	6.1E-05	mg/kg/day	NA	NA	NA	4.3E-03	mg/kg/day	1.0E+00	mg/kg/day	4.3E-03
				Antimony	4.1E-01	mg/kg	5.0E-09	mg/kg/day	NA	NA	NA	3.5E-07	mg/kg/day	4.0E-04	mg/kg/day	8.8E-04
				Arsenic	1.5E+01	mg/kg	1.9E-07	mg/kg/day	1.5E+00	1/(mg/kg-day)	2.8E-07	1.3E-05	mg/kg/day	3.0E-04	mg/kg/day	4.4E-02
				Barium	4.9E+01	mg/kg	5.9E-07	mg/kg/day	NA	NA	NA	4.2E-05	mg/kg/day	7.0E-02	mg/kg/day	5.9E-04
				Cadmium	1.6E+00	mg/kg	1.9E-08	mg/kg/day	NA	NA	NA	1.3E-06	mg/kg/day	1.0E-03	mg/kg/day	1.3E-03
				Chromium	9.7E+00	mg/kg	1.2E-07	mg/kg/day	NA	NA	NA	8.4E-06	mg/kg/day	2.0E-02	mg/kg/day	4.2E-04
				Copper	1.9E+01	mg/kg	2.4E-07	mg/kg/day	NA	NA	NA	1.7E-05	mg/kg/day	4.0E-02	mg/kg/day	4.2E-04
				Iron	1.1E+04	mg/kg	1.4E-04	mg/kg/day	NA	NA	NA	9.6E-03	mg/kg/day	3.0E-01	mg/kg/day	3.2E-02
				Manganese	6.8E+01	mg/kg	8.3E-07	mg/kg/day	NA	NA	NA	5.8E-05	mg/kg/day	2.0E-02	mg/kg/day	2.9E-03
				Mercury	6.0E-02	mg/kg	7.3E-10	mg/kg/day	NA	NA	NA	5.1E-08	mg/kg/day	3.0E-04	mg/kg/day	1.7E-04
				Nickel	5.4E+00	mg/kg	6.6E-08	mg/kg/day	NA	NA	NA	4.6E-06	mg/kg/day	2.0E-02	mg/kg/day	2.3E-04
				Thallium	3.6E-01	mg/kg	4.4E-09	mg/kg/day	NA	NA	NA	3.1E-07	mg/kg/day	7.0E-05	mg/kg/day	4.4E-03
				Vanadium	1.9E+01	mg/kg	2.3E-07	mg/kg/day	NA	NA	NA	1.6E-05	mg/kg/day	1.0E-03	mg/kg/day	1.6E-02
				Zinc	4.9E+02	mg/kg	6.0E-06	mg/kg/day	NA	NA	NA	4.2E-04	mg/kg/day	3.0E-01	mg/kg/day	1.4E-03
			Exp. Route Total								3.3E-07					1.1E-01
			Dermal	Benzo(a)pyrene	1.7E-01	mg/kg	8.8E-10	mg/kg/day	7.3E+00	1/(mg/kg-day)	6.5E-09	6.2E-08	mg/kg/day	NA	NA	NA
			Absorption	Benzo(b)fluoranthene	1.7E-01	mg/kg	9.0E-10	mg/kg/day	7.3E-01	1/(mg/kg-day)	6.6E-10	6.3E-08	mg/kg/day	NA	NA	NA
				Dibenz(a,h)anthracene	2.3E-01	mg/kg	1.2E-09	mg/kg/day	7.3E+00	1/(mg/kg-day)	8.7E-09	8.3E-08	mg/kg/day	NA	NA	NA
				Indeno(1,2,3-cd)pyrene	1.7E-01	mg/kg	9.2E-10	mg/kg/day	7.3E-01	1/(mg/kg-day)	6.7E-10	6.4E-08	mg/kg/day	NA	NA	NA
				n-Nitroso-di-n-propylamine	1.0E-01	mg/kg	4.0E-10	mg/kg/day	7.0E+00	1/(mg/kg-day)	2.8E-09	2.8E-08	mg/kg/day	NA	NA	NA
				Aluminum	5.0E+03	mg/kg	2.0E-06	mg/kg/day	NA	NA	NA	1.4E-04	mg/kg/day	1.0E+00	mg/kg/day	1.4E-04
				Antimony	4.1E-01	mg/kg	1.7E-10	mg/kg/day	NA	NA	NA	1.2E-08	mg/kg/day	6.0E-05	mg/kg/day	1.9E-04
				Arsenic	1.5E+01	mg/kg	1.8E-08	mg/kg/day	1.5E+00	1/(mg/kg-day)	2.8E-08	1.3E-06	mg/kg/day	3.0E-04	mg/kg/day	4.3E-03
				Barium	4.9E+01	mg/kg	2.0E-08	mg/kg/day	NA	NA	NA	1.4E-06	mg/kg/day	4.9E-03	mg/kg/day	2.8E-04
				Cadmium	1.6E+00	mg/kg	6.4E-11	mg/kg/day	NA	NA	NA	4.5E-09	mg/kg/day	2.5E-05	mg/kg/day	1.8E-04
				Chromium	9.7E+00	mg/kg	3.9E-09	mg/kg/day	NA	NA	NA	2.8E-07	mg/kg/day	5.0E-04	mg/kg/day	5.5E-04
				Copper	1.9E+01	mg/kg	7.8E-09	mg/kg/day	NA	NA	NA	5.5E-07	mg/kg/day	4.0E-02	mg/kg/day	1.4E-05

TABLE 7.4.CTE

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
					Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
							Value	Units	Value	Units		Value	Units	Value	Units	
Soil*	Soil*	Site 28 Soil*	Dermal	Iron	1.1E+04	mg/kg	4.5E-06	mg/kg/day	NA	NA	NA	3.2E-04	mg/kg/day	3.0E-01	mg/kg/day	1.1E-03
			Absorption	Manganese	6.8E+01	mg/kg	2.7E-08	mg/kg/day	NA	NA	NA	1.9E-06	mg/kg/day	8.0E-04	mg/kg/day	2.4E-03
				Mercury	6.0E-02	mg/kg	2.4E-11	mg/kg/day	NA	NA	NA	1.7E-09	mg/kg/day	2.1E-05	mg/kg/day	8.0E-05
				Nickel	5.4E+00	mg/kg	2.2E-09	mg/kg/day	NA	NA	NA	1.5E-07	mg/kg/day	8.0E-04	mg/kg/day	1.9E-04
				Thallium	3.6E-01	mg/kg	1.5E-10	mg/kg/day	NA	NA	NA	1.0E-08	mg/kg/day	7.0E-05	mg/kg/day	1.5E-04
				Vanadium	1.9E+01	mg/kg	7.5E-09	mg/kg/day	NA	NA	NA	5.3E-07	mg/kg/day	2.6E-05	mg/kg/day	2.0E-02
				Zinc	4.9E+02	mg/kg	2.0E-07	mg/kg/day	NA	NA	NA	1.4E-05	mg/kg/day	3.0E-01	mg/kg/day	4.6E-05
			Exp. Route Total								4.7E-08					3.0E-02
		Exposure Point Total									3.7E-07					1.4E-01
	Exposure Medium Total										3.7E-07					1.4E-01
Soil* Total											3.7E-07					1.4E-01
Groundwater	Groundwater	Water in Excavation Pit	Dermal	Aluminum	8.2E+03	ug/l	1.3E-05	NA	NA	NA	NA	9.3E-04	mg/kg/day	1.0E+00	mg/kg/day	9.3E-04
				Antimony	1.2E+00	ug/l	1.9E-09	NA	NA	NA	NA	1.3E-07	mg/kg/day	6.0E-05	mg/kg/day	2.2E-03
				Arsenic	1.2E+02	ug/l	2.0E-07	NA	1.5E+00	mg/kg/day	3.0E-07	1.4E-05	mg/kg/day	3.0E-04	mg/kg/day	4.6E-02
				Cadmium	1.0E+00	ug/l	1.7E-09	NA	NA	NA	NA	1.2E-07	mg/kg/day	2.5E-05	mg/kg/day	4.6E-03
				Chromium	1.4E+01	ug/l	4.4E-08	NA	NA	NA	NA	3.1E-06	mg/kg/day	5.0E-04	mg/kg/day	6.2E-03
				Iron	1.5E+04	ug/l	2.4E-05	NA	NA	NA	NA	1.7E-03	mg/kg/day	3.0E-01	mg/kg/day	5.6E-03
				Vanadium	2.4E+01	ug/l	3.9E-08	NA	NA	NA	NA	2.7E-06	mg/kg/day	2.6E-05	mg/kg/day	1.0E-01
				Zinc	8.1E+02	ug/l	7.9E-07	NA	NA	NA	NA	5.5E-05	mg/kg/day	3.0E-01	mg/kg/day	1.8E-04
			Exp. Route Total								3.0E-07					1.7E-01
		Exposure Point Total									3.0E-07					1.7E-01
	Exposure Medium Total										3.0E-07					1.7E-01
Groundwater Total											3.0E-07					1.7E-01
											Total of Receptor Risks Across All Media	6.7E-07		Total of Receptor Hazards Across All Media		3.1E-01

* Surface and subsurface soil combined.

Table 7.4.CTE Supplement A
Calculation of DAevent
Construction Worker, Groundwater
Site 28 IHDIV-NSWC
Indian Head, Maryland

Chemical of Potential Concern	Groundwater Concentration (CW) (µg/L)	Permeability Coefficient (Kp) (cm/hr)	B (dimensionless)	Lag Time (τ_{event}) (hr)	t* (hr)	Fraction Absorbed Water (FA) (dimensionless)	Duration of Event (tevent) (hr)	DAevent (mg/cm^2-event)	Eq
Aluminum	8.2E+03	1.0E-03	NA	NA	NA	NA	4	3.3E-05	1
Antimony	1.2E+00	1.0E-03	NA	NA	NA	NA	4	4.7E-09	1
Arsenic	1.2E+02	1.0E-03	NA	NA	NA	NA	4	4.9E-07	1
Cadmium	1.0E+00	1.0E-03	NA	NA	NA	NA	4	4.1E-09	1
Chromium	1.4E+01	2.0E-03	NA	NA	NA	NA	4	1.1E-07	1
Iron	1.5E+04	1.0E-03	NA	NA	NA	NA	4	6.0E-05	1
Vanadium	2.4E+01	1.0E-03	NA	NA	NA	NA	4	9.6E-08	1
Zinc	8.1E+02	6.0E-04	NA	NA	NA	NA	4	2.0E-06	1

Inorganics: DAevent (mg/cm2-event) =

Kp x CW x tevent x 0.001 mg/ug x 0.001 l/cm^3 (eq 1)

Organics: DAevent (mg/cm2-event) =

$$\text{If } t_{event} \le t^*, \text{then } DA_{event} = 2 \times FA \times K_p \times C_w \sqrt{\frac{6 \times \tau_{event} \times t_{event}}{\pi}} \qquad \text{(eq 2)}$$

$$\text{If } t_{event} \ge t^*, \text{ then } DA_{event} = FA \times K_p \times C_w \left[\frac{t_{event}}{1+B} + 2 \times \tau_{event} \left(\frac{1+3B+3B^2}{(1+B)^2} \right) \right] \qquad \text{(eq 3)}$$

Notes:

Permeability constants from EPA 2001, *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment - Interim).* EPA/540/R/99/005. The default value of 0.001 was assigned to inorganics not listed in this document.

NA - not applicable.

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Current
Receptor Population: Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Site 28 Soil*	Benzo(a)pyrene	1.4E-07	NA	3.9E-08	1.8E-07	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	1.7E-08	NA	4.6E-09	2.2E-08	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	1.5E-07	NA	4.0E-08	1.9E-07	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	1.6E-08	NA	4.2E-09	2.0E-08	NA	NA	NA	NA	0.0E+00
			n-Nitroso-di-n-propylamine	4.7E-08	NA	9.7E-09	5.7E-08	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	1.2E-03	NA	2.5E-05	1.3E-03
			Antimony	NA	NA	NA	0.0E+00	Blood	1.2E-02	NA	1.7E-03	1.4E-02
			Arsenic	1.2E-05	NA	7.7E-07	1.3E-05	Skin, Vascular	7.8E-02	NA	4.8E-03	8.2E-02
			Barium	NA	NA	NA	0.0E+00	NOAEL	1.1E-03	NA	3.1E-04	1.4E-03
			Cadmium	NA	NA	NA	0.0E+00	Kidney	8.3E-03	NA	6.9E-04	9.0E-03
			Chromium	NA	NA	NA	0.0E+00	NOAEL	2.0E-03	NA	1.7E-03	3.7E-03
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	1.6E-03	NA	3.3E-05	1.7E-03
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	1.4E-02	NA	2.9E-04	1.4E-02
			Manganese	NA	NA	NA	0.0E+00	CNS	2.2E-03	NA	1.1E-03	3.3E-03
			Mercury	NA	NA	NA	0.0E+00	Immune System	8.3E-04	NA	2.5E-04	1.1E-03
			Nickel	NA	NA	NA	0.0E+00	Whole Body	1.3E-04	NA	6.7E-05	2.0E-04
			Thallium	NA	NA	NA	0.0E+00	Liver, Blood, Hair	1.3E-03	NA	2.6E-05	1.3E-03
			Vanadium	NA	NA	NA	0.0E+00	Kidney	5.0E-03	NA	4.0E-03	8.9E-03
			Zinc	NA	NA	NA	0.0E+00	Blood	1.5E-02	NA	3.2E-04	1.6E-02
Chemical Total				1.3E-05	NA	8.7E-07	1.4E-05		1.4E-01	NA	1.5E-02	1.6E-01
Medium Total							1.4E-05					1.6E-01
Receptor Total							1.4E-05				Receptor HI Total	1.6E-01

* Surface and subsurface soil combined.

Total CNS HI Across All Media =	4.6E-03
Total Blood HI Across All Media =	3.1E-02
Total Skin HI Across All Media =	8.2E-02
Total Vascular HI Across All Media =	8.2E-02
Total NOAEL HI Across All Media =	5.0E-03
Total Kidney HI Across All Media =	1.8E-02
Total Immune System HI Across All Media =	1.1E-03
Total Gastrointestinal HI Across All Media =	1.6E-02
Total Liver HI Across All Media =	1.3E-03
Total Whole Body HI Across All Media =	2.0E-04
Total Hair HI Across All Media =	1.3E-03

TABLE 9.2.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Receptor Population: Trespasser
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 28 Surface Soil	Benzo(a)pyrene	1.9E-07	NA	4.2E-07	6.0E-07	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	2.4E-08	NA	5.4E-08	7.8E-08	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	2.0E-07	NA	4.4E-07	6.3E-07	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	2.1E-08	NA	4.7E-08	6.8E-08	NA	NA	NA	NA	0.0E+00
			n-Nitroso-di-n-propylamine	2.2E-07	NA	3.7E-07	5.9E-07	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	1.3E-03	NA	2.3E-04	1.6E-03
			Antimony	NA	NA	NA	0.0E+00	Blood	3.9E-03	NA	4.4E-03	8.3E-03
			Arsenic	1.6E-05	NA	8.2E-06	2.4E-05	Skin, Vascular	1.0E-01	NA	5.3E-02	1.6E-01
			Barium	NA	NA	NA	0.0E+00	NOAEL	1.4E-03	NA	3.3E-03	4.7E-03
			Cadmium	NA	NA	NA	0.0E+00	Kidney	1.2E-02	NA	8.4E-03	2.1E-02
			Chromium	NA	NA	NA	0.0E+00	NOAEL	2.8E-03	NA	1.9E-02	2.2E-02
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	2.0E-03	NA	3.4E-04	2.3E-03
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	1.7E-02	NA	2.9E-03	2.0E-02
			Manganese	NA	NA	NA	0.0E+00	CNS	3.5E-03	NA	1.5E-02	1.8E-02
			Mercury	NA	NA	NA	0.0E+00	Immune System	1.8E-03	NA	4.3E-03	6.1E-03
			Vanadium	NA	NA	NA	0.0E+00	Kidney	6.9E-03	NA	4.6E-02	5.3E-02
			Zinc	NA	NA	NA	0.0E+00	Blood	2.7E-02	NA	4.6E-03	3.1E-02
Chemical Total				1.7E-05	NA	9.5E-06	2.6E-05		1.8E-01	NA	1.6E-01	3.4E-01
Medium Total							2.6E-05					3.4E-01
Receptor Total							2.6E-05				Receptor HI Total	3.4E-01

Total CNS HI Across All Media =	2.0E-02
Total Blood HI Across All Media =	4.0E-02
Total Skin HI Across All Media =	1.6E-01
Total Vascular HI Across All Media =	1.6E-01
Total NOAEL HI Across All Media =	2.7E-02
Total Kidney HI Across All Media =	7.3E-02
Total Immune System HI Across All Media =	6.1E-03
Total Gastrointestinal HI Across All Media =	2.2E-02

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Soil	Surface Soil	Site 28 Surface Soil	Benzo(a)pyrene	9.6E-08	NA	1.7E-07	2.6E-07	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	1.2E-08	NA	2.1E-08	3.4E-08	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	1.0E-07	NA	1.7E-07	2.7E-07	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	1.1E-08	NA	1.9E-08	2.9E-08	NA	NA	NA	NA	0.0E+00
			n-Nitroso-di-n-propylamine	1.1E-07	NA	1.5E-07	2.6E-07	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	1.8E-03	NA	2.4E-04	2.1E-03
			Antimony	NA	NA	NA	0.0E+00	Blood	5.3E-03	NA	4.7E-03	1.0E-02
			Arsenic	8.2E-06	NA	3.3E-06	1.1E-05	Skin, Vascular	1.4E-01	NA	5.6E-02	2.0E-01
			Barium	NA	NA	NA	0.0E+00	NOAEL	1.9E-03	NA	3.5E-03	5.4E-03
			Cadmium	NA	NA	NA	0.0E+00	Kidney	1.7E-02	NA	8.9E-03	2.6E-02
			Chromium	NA	NA	NA	0.0E+00	NOAEL	3.9E-03	NA	2.0E-02	2.4E-02
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	2.7E-03	NA	3.6E-04	3.1E-03
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	2.3E-02	NA	3.0E-03	2.6E-02
			Manganese	NA	NA	NA	0.0E+00	CNS	4.8E-03	NA	1.6E-02	2.1E-02
			Mercury	NA	NA	NA	0.0E+00	Immune System	2.4E-03	NA	4.5E-03	7.0E-03
			Vanadium	NA	NA	NA	0.0E+00	Kidney	9.5E-03	NA	4.8E-02	5.8E-02
			Zinc	NA	NA	NA	0.0E+00	Blood	3.7E-02	NA	4.9E-03	4.2E-02
Chemical Total				8.6E-06	NA	3.8E-06	1.2E-05		2.5E-01	NA	1.7E-01	4.2E-01
Medium Total							1.2E-05					4.2E-01
Receptor Total							1.2E-05				Receptor HI Total	4.2E-01

Total CNS HI Across All Media =	2.3E-02
Total Blood HI Across All Media =	5.2E-02
Total Skin HI Across All Media =	2.0E-01
Total Vascular HI Across All Media =	2.0E-01
Total NOAEL HI Across All Media =	3.0E-02
Total Kidney HI Across All Media =	8.4E-02
Total Immune System HI Across All Media =	7.0E-03
Total Gastrointestinal HI Across All Media =	2.9E-02

TABLE 9.4.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe:	Current/Future
Receptor Population:	Recreation
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Mattawoman Creek	Arsenic	2.6E-07	NA	3.2E-08	2.9E-07	Skin, Vascular	1.7E-03	NA	2.1E-04	1.9E-03
Chemical Total				2.6E-07	NA	3.2E-08	2.9E-07		1.7E-03	NA	2.1E-04	1.9E-03
Medium Total							2.9E-07					1.9E-03
Receptor Total							2.9E-07				Receptor HI Total	1.9E-03

Total Skin HI Across All Media =	1.9E-03
Total Vascular HI Across All Media =	1.9E-03

TABLE 9.5.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Current/Future
Receptor Population: Recreation
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Surface Water	Surface Water	Mattawoman Creek	Arsenic	1.3E-07	NA	1.4E-08	1.5E-07	Skin, Vascular	2.3E-03	NA	2.4E-04	2.5E-03
Chemical Total				1.3E-07	NA	1.4E-08	1.5E-07		2.3E-03	NA	2.4E-04	2.5E-03
Medium Total							1.5E-07					2.5E-03
Receptor Total							1.5E-07				Receptor HI Total	2.5E-03

Total Skin HI Across All Media =	2.5E-03
Total Vascular HI Across All Media =	2.5E-03

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Site 28 Soil*	Benzo(a)pyrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			n-Nitroso-di-n-propylamine	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	9.0E-03	NA	3.6E-04	9.3E-03
			Antimony	NA	NA	NA	0.0E+00	Blood	8.8E-02	NA	2.3E-02	1.1E-01
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	5.7E-01	NA	6.8E-02	6.3E-01
			Barium	NA	NA	NA	0.0E+00	NOAEL	7.8E-03	NA	4.4E-03	1.2E-02
			Cadmium	NA	NA	NA	0.0E+00	Kidney	6.1E-02	NA	9.7E-03	7.0E-02
			Chromium	NA	NA	NA	0.0E+00	NOAEL	1.5E-02	NA	2.3E-02	3.8E-02
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	1.2E-02	NA	4.7E-04	1.2E-02
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	1.0E-01	NA	4.1E-03	1.1E-01
			Manganese	NA	NA	NA	0.0E+00	CNS	1.6E-02	NA	1.6E-02	3.2E-02
			Mercury	NA	NA	NA	0.0E+00	Immune System	6.1E-03	NA	3.5E-03	9.6E-03
			Nickel	NA	NA	NA	0.0E+00	Whole Body	9.4E-04	NA	9.4E-04	1.9E-03
			Thallium	NA	NA	NA	0.0E+00	Liver, Blood, Hair	9.1E-03	NA	3.6E-04	9.5E-03
			Vanadium	NA	NA	NA	0.0E+00	Kidney	3.6E-02	NA	5.6E-02	9.2E-02
			Zinc	NA	NA	NA	0.0E+00	Blood	1.1E-01	NA	4.5E-03	1.2E-01
Chemical Total				NA	NA	NA	0.0E+00		1.0E+00	NA	2.1E-01	1.3E+00
Medium Total							0.0E+00					1.3E+00

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	bis(2-Ethylhexyl)phthalate	NA	NA	NA	0.0E+00	Liver	3.4E-01	NA	5.3E-01	8.7E-01
			Aluminum	NA	NA	NA	0.0E+00	CNS	5.3E-01	NA	2.8E-03	5.3E-01
			Antimony	NA	NA	NA	0.0E+00	Blood	1.4E-01	NA	5.0E-03	1.5E-01
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	3.1E+01	NA	1.6E-01	3.1E+01
			Cadmium	NA	NA	NA	0.0E+00	Kidney	1.8E-01	NA	1.9E-02	2.0E-01
			Chromium	NA	NA	NA	0.0E+00	NOAEL	2.5E-01	NA	1.0E-01	3.5E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	3.3E+00	NA	1.7E-02	3.3E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	8.2E-01	NA	1.1E-01	9.3E-01
			Vanadium	NA	NA	NA	0.0E+00	Kidney	1.7E+00	NA	3.4E-01	2.0E+00
			Zinc	NA	NA	NA	0.0E+00	Blood	1.5E-01	NA	4.6E-04	1.5E-01
Chemical Total				NA	NA	NA	0.0E+00		3.9E+01	NA	1.3E+00	4.0E+01
Medium Total							0.0E+00					4.0E+01
Receptor Total							0.0E+00				Receptor HI Total	4.1E+01

* Surface and subsurface soil combined.

Total CNS HI Across All Media =	1.5E+00
Total Blood HI Across All Media =	5.3E-01
Total Skin HI Across All Media =	3.2E+01
Total Vascular HI Across All Media =	3.2E+01
Total NOAEL HI Across All Media =	4.0E-01
Total Kidney HI Across All Media =	2.4E+00
Total Immune System HI Across All Media =	9.6E-03
Total Gastrointestinal HI Across All Media =	3.5E+00
Total Liver HI Across All Media =	#REF!
Total Whole Body HI Across All Media =	1.9E-03
Total Hair HI Across All Media =	9.5E-03

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Site 28 Soil*	Benzo(a)pyrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			n-Nitroso-di-n-propylamine	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	8.4E-02	NA	2.3E-03	8.6E-02
			Antimony	NA	NA	NA	0.0E+00	Blood	8.2E-01	NA	1.5E-01	9.7E-01
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	5.3E+00	NA	4.4E-01	5.7E+00
			Barium	NA	NA	NA	0.0E+00	NOAEL	7.2E-02	NA	2.9E-02	1.0E-01
			Cadmium	NA	NA	NA	0.0E+00	Kidney	5.7E-01	NA	6.3E-02	6.3E-01
			Chromium	NA	NA	NA	0.0E+00	NOAEL	1.4E-01	NA	1.5E-01	2.9E-01
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	1.1E-01	NA	3.1E-03	1.1E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	9.6E-01	NA	2.7E-02	9.8E-01
			Manganese	NA	NA	NA	0.0E+00	CNS	1.5E-01	NA	1.0E-01	2.5E-01
			Mercury	NA	NA	NA	0.0E+00	Immune System	5.7E-02	NA	2.3E-02	8.0E-02
			Nickel	NA	NA	NA	0.0E+00	Whole Body	8.8E-03	NA	6.2E-03	1.5E-02
			Thallium	NA	NA	NA	0.0E+00	Liver, Blood, Hair	8.5E-02	NA	2.4E-03	8.8E-02
			Vanadium	NA	NA	NA	0.0E+00	Kidney	3.4E-01	NA	3.7E-01	7.1E-01
			Zinc	NA	NA	NA	0.0E+00	Blood	1.0E+00	NA	2.9E-02	1.1E+00
Chemical Total				NA	NA	NA	0.0E+00		9.7E+00	NA	1.4E+00	1.1E+01
Medium Total							0.0E+00					1.1E+01

TABLE 9.7.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	bis(2-Ethylhexyl)phthalate	NA	NA	NA	0.0E+00	Liver	8.0E-01	NA	1.2E+00	2.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	1.2E+00	NA	8.1E-03	1.2E+00
			Antimony	NA	NA	NA	0.0E+00	Blood	3.4E-01	NA	1.5E-02	3.5E-01
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	7.3E+01	NA	4.8E-01	7.3E+01
			Cadmium	NA	NA	NA	0.0E+00	Kidney	4.2E-01	NA	5.6E-02	4.8E-01
			Chromium	NA	NA	NA	0.0E+00	NOAEL	5.8E-01	NA	3.1E-01	8.9E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	7.8E+00	NA	5.1E-02	7.8E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	1.9E+00	NA	3.2E-01	2.2E+00
			Vanadium	NA	NA	NA	0.0E+00	Kidney	4.0E+00	NA	1.0E+00	5.0E+00
			Zinc	NA	NA	NA	0.0E+00	Blood	3.5E-01	NA	1.4E-03	3.5E-01
Chemical Total				NA	NA	NA	0.0E+00		9.0E+01	NA	3.4E+00	9.4E+01
Medium Total							0.0E+00					9.4E+01
Receptor Total							0.0E+00				Receptor HI Total	1.0E+02

* Surface and subsurface soil combined.

Total CNS HI Across All Media =	3.8E+00
Total Blood HI Across All Media =	2.7E+00
Total Skin HI Across All Media =	7.9E+01
Total Vascular HI Across All Media =	7.9E+01
Total NOAEL HI Across All Media =	1.3E+00
Total Kidney HI Across All Media =	6.8E+00
Total Immune System HI Across All Media =	8.0E-02
Total Gastrointestinal HI Across All Media =	8.9E+00
Total Liver HI Across All Media =	2.1E+00
Total Whole Body HI Across All Media =	1.5E-02
Total Hair HI Across All Media =	8.8E-02

TABLE 9.8.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Site 28 Soil*	Benzo(a)pyrene	3.4E-06	NA	1.4E-06	4.7E-06	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	4.0E-07	NA	1.7E-07	5.7E-07	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	3.4E-06	NA	1.4E-06	4.8E-06	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	3.6E-07	NA	1.5E-07	5.1E-07	NA	NA	NA	NA	0.0E+00
			n-Nitroso-di-n-propylamine	1.1E-06	NA	3.5E-07	1.4E-06	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	NA	NA	NA	0.0E+00
			Antimony	NA	NA	NA	0.0E+00	Blood	NA	NA	NA	0.0E+00
			Arsenic	2.9E-04	NA	2.8E-05	3.2E-04	Skin, Vascular	NA	NA	NA	0.0E+00
			Barium	NA	NA	NA	0.0E+00	NOAEL	NA	NA	NA	0.0E+00
			Cadmium	NA	NA	NA	0.0E+00	Kidney	NA	NA	NA	0.0E+00
			Chromium	NA	NA	NA	0.0E+00	NOAEL	NA	NA	NA	0.0E+00
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	NA	NA	NA	0.0E+00
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	NA	NA	NA	0.0E+00
			Mercury	NA	NA	NA	0.0E+00	Immune System	NA	NA	NA	0.0E+00
			Nickel	NA	NA	NA	0.0E+00	Whole Body	NA	NA	NA	0.0E+00
			Thallium	NA	NA	NA	0.0E+00	Liver, Blood, Hair	NA	NA	NA	0.0E+00
			Vanadium	NA	NA	NA	0.0E+00	Kidney	NA	NA	NA	0.0E+00
			Zinc	NA	NA	NA	0.0E+00	Blood	NA	NA	NA	0.0E+00
Chemical Total				3.0E-04	NA	3.1E-05	3.3E-04		NA	NA	NA	0.0E+00
Medium Total							3.3E-04					0.0E+00

TABLE 9.8.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	bis(2-Ethylhexyl)phthalate	5.2E-05	NA	7.9E-05	1.3E-04	Liver	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	NA	NA	NA	0.0E+00
			Antimony	NA	NA	NA	0.0E+00	Blood	NA	NA	NA	0.0E+00
			Arsenic	7.7E-03	NA	4.4E-05	7.7E-03	Skin, Vascular	NA	NA	NA	0.0E+00
			Cadmium	NA	NA	NA	0.0E+00	Kidney	NA	NA	NA	0.0E+00
			Chromium	NA	NA	NA	0.0E+00	NOAEL	NA	NA	NA	0.0E+00
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	NA	NA	NA	0.0E+00
			Vanadium	NA	NA	NA	0.0E+00	Kidney	NA	NA	NA	0.0E+00
			Zinc	NA	NA	NA	0.0E+00	Blood	NA	NA	NA	0.0E+00
Chemical Total				7.7E-03	NA	1.2E-04	7.8E-03		NA	NA	NA	0.0E+00
Medium Total							7.8E-03					0.0E+00
Receptor Total							8.2E-03				Receptor HI Total	0.0E+00

* Surface and subsurface soil combined.

TABLE 9.9.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Site 28 Soil*	Benzo(a)pyrene	1.4E-07	NA	3.9E-08	1.8E-07	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	1.7E-08	NA	4.6E-09	2.2E-08	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	1.5E-07	NA	4.0E-08	1.9E-07	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	1.6E-08	NA	4.2E-09	2.0E-08	NA	NA	NA	NA	0.0E+00
			n-Nitroso-di-n-propylamine	4.7E-08	NA	9.7E-09	5.7E-08	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	3.1E-02	NA	6.3E-04	3.1E-02
			Antimony	NA	NA	NA	0.0E+00	Blood	3.0E-01	NA	4.1E-02	3.4E-01
			Arsenic	1.2E-05	NA	7.7E-07	1.3E-05	Skin, Vascular	1.9E+00	NA	1.2E-01	2.1E+00
			Barium	NA	NA	NA	0.0E+00	NOAEL	2.7E-02	NA	7.8E-03	3.4E-02
			Cadmium	NA	NA	NA	0.0E+00	Kidney	2.1E-01	NA	1.7E-02	2.2E-01
			Chromium	NA	NA	NA	0.0E+00	NOAEL	7.5E-03	NA	6.2E-03	1.4E-02
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	4.0E-02	NA	8.3E-04	4.1E-02
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	3.5E-01	NA	7.2E-03	3.6E-01
			Manganese	NA	NA	NA	0.0E+00	CNS	5.5E-02	NA	2.8E-02	8.3E-02
			Mercury	NA	NA	NA	0.0E+00	Immune System	2.1E-02	NA	6.1E-03	2.7E-02
			Nickel	NA	NA	NA	0.0E+00	Whole Body	3.2E-03	NA	1.7E-03	4.9E-03
			Thallium	NA	NA	NA	0.0E+00	Liver, Blood, Hair	3.1E-02	NA	6.5E-04	3.2E-02
			Vanadium	NA	NA	NA	0.0E+00	Kidney	1.2E-01	NA	9.9E-02	2.2E-01
			Zinc	NA	NA	NA	0.0E+00	Blood	3.8E-01	NA	7.9E-03	3.9E-01
Chemical Total				1.3E-05	NA	8.7E-07	1.4E-05		3.5E+00	NA	3.4E-01	3.9E+00
Medium Total							1.4E-05					3.9E+00

TABLE 9.9.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Aluminum	NA	NA	NA	0.0E+00	CNS	NA	NA	1.3E-02	1.3E-02
			Antimony	NA	NA	1.8E-06	1.8E-06	Blood	NA	NA	2.7E-01	2.7E-01
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	NA	NA	1.0E-01	1.0E-01
			Cadmium	NA	NA	NA	0.0E+00	Kidney	NA	NA	1.3E-02	1.3E-02
			Chromium	NA	NA	NA	0.0E+00	NOAEL	NA	NA	1.3E-02	1.3E-02
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	NA	NA	2.3E-01	2.3E-01
			Vanadium	NA	NA	1.8E-06	1.8E-06	Kidney	NA	NA	6.5E-01	6.5E-01
			Zinc	NA	NA	1.8E-06	1.8E-06	Blood	NA	NA	6.5E-01	6.5E-01
Chemical Total				NA	NA	5.3E-06	5.3E-06		NA	NA	2.0E+00	2.0E+00
Medium Total							5.3E-06					2.0E+00
Receptor Total							1.9E-05				Receptor HI Total	5.8E+00

* Surface and subsurface soil combined.

Total CNS HI Across All Media =	1.3E-01
Total Blood HI Across All Media =	1.7E+00
Total Skin HI Across All Media =	2.2E+00
Total Vascular HI Across All Media =	2.2E+00
Total NOAEL HI Across All Media =	6.1E-02
Total Kidney HI Across All Media =	1.1E+00
Total Immune System HI Across All Media =	2.7E-02
Total Gastrointestinal HI Across All Media =	6.3E-01
Total Liver HI Across All Media =	3.2E-02
Total Whole Body HI Across All Media =	4.9E-03
Total Hair HI Across All Media =	3.2E-02

TABLE 9.10.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Trespasser
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Site 28 Soil*	Benzo(a)pyrene	1.5E-07	NA	3.3E-07	4.8E-07	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	1.8E-08	NA	4.0E-08	5.8E-08	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	1.5E-07	NA	3.4E-07	4.9E-07	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	1.6E-08	NA	3.6E-08	5.2E-08	NA	NA	NA	NA	0.0E+00
			n-Nitroso-di-n-propylamine	4.9E-08	NA	8.4E-08	1.3E-07	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	1.3E-03	NA	2.3E-04	1.6E-03
			Antimony	NA	NA	NA	0.0E+00	Blood	1.3E-02	NA	1.5E-02	2.8E-02
			Arsenic	1.3E-05	NA	6.7E-06	2.0E-05	Skin, Vascular	8.4E-02	NA	4.3E-02	1.3E-01
			Barium	NA	NA	NA	0.0E+00	NOAEL	1.2E-03	NA	2.8E-03	4.0E-03
			Cadmium	NA	NA	NA	0.0E+00	Kidney	9.0E-03	NA	6.2E-03	1.5E-02
			Chromium	NA	NA	NA	0.0E+00	NOAEL	2.2E-03	NA	1.5E-02	1.7E-02
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	1.8E-03	NA	3.0E-04	2.1E-03
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	1.5E-02	NA	2.6E-03	1.8E-02
			Manganese	NA	NA	NA	0.0E+00	CNS	2.4E-03	NA	1.0E-02	1.3E-02
			Mercury	NA	NA	NA	0.0E+00	Immune System	9.0E-04	NA	2.2E-03	3.1E-03
			Nickel	NA	NA	NA	0.0E+00	Whole Body	1.4E-04	NA	6.0E-04	7.4E-04
			Thallium	NA	NA	NA	0.0E+00	Liver, Blood, Hair	1.4E-03	NA	2.3E-04	1.6E-03
			Vanadium	NA	NA	NA	0.0E+00	Kidney	5.4E-03	NA	3.6E-02	4.1E-02
			Zinc	NA	NA	NA	0.0E+00	Blood	1.7E-02	NA	2.8E-03	1.9E-02
Chemical Total				1.3E-05	NA	7.5E-06	2.1E-05		1.5E-01	NA	1.4E-01	2.9E-01
Medium Total							2.1E-05					2.9E-01
Receptor Total							2.1E-05				Receptor HI Total	2.9E-01

* Surface and subsurface soil combined.

Total CNS HI Across All Media =	1.4E-02
Total Blood HI Across All Media =	4.9E-02
Total Skin HI Across All Media =	1.3E-01
Total Vascular HI Across All Media =	1.3E-01
Total NOAEL HI Across All Media =	2.1E-02
Total Kidney HI Across All Media =	5.6E-02
Total Immune System HI Across All Media =	3.1E-03
Total Gastrointestinal HI Across All Media =	2.0E-02
Total Liver HI Across All Media =	1.6E-03
Total Whole Body HI Across All Media =	7.4E-04
Total Hair HI Across All Media =	1.6E-03

TABLE 9.11.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Trespasser
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Site 28 Soil*	Benzo(a)pyrene	7.7E-08	NA	1.3E-07	2.1E-07	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	9.3E-09	NA	1.6E-08	2.5E-08	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	7.9E-08	NA	1.4E-07	2.1E-07	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	8.3E-09	NA	1.4E-08	2.3E-08	NA	NA	NA	NA	0.0E+00
			n-Nitroso-di-n-propylamine	2.5E-08	NA	3.3E-08	5.8E-08	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	1.8E-03	NA	2.4E-04	2.1E-03
			Antimony	NA	NA	NA	0.0E+00	Blood	1.8E-02	NA	1.6E-02	3.4E-02
			Arsenic	6.7E-06	NA	2.6E-06	9.3E-06	Skin, Vascular	1.2E-01	NA	4.6E-02	1.6E-01
			Barium	NA	NA	NA	0.0E+00	NOAEL	1.6E-03	NA	3.0E-03	4.6E-03
			Cadmium	NA	NA	NA	0.0E+00	Kidney	1.2E-02	NA	6.5E-03	1.9E-02
			Chromium	NA	NA	NA	0.0E+00	NOAEL	3.0E-03	NA	1.6E-02	1.9E-02
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	2.4E-03	NA	3.2E-04	2.7E-03
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	2.1E-02	NA	2.8E-03	2.4E-02
			Manganese	NA	NA	NA	0.0E+00	CNS	3.3E-03	NA	1.1E-02	1.4E-02
			Mercury	NA	NA	NA	0.0E+00	Immune System	1.2E-03	NA	2.3E-03	3.6E-03
			Nickel	NA	NA	NA	0.0E+00	Whole Body	1.9E-04	NA	6.3E-04	8.3E-04
			Thallium	NA	NA	NA	0.0E+00	Liver, Blood, Hair	1.9E-03	NA	2.5E-04	2.1E-03
			Vanadium	NA	NA	NA	0.0E+00	Kidney	7.4E-03	NA	3.8E-02	4.5E-02
			Zinc	NA	NA	NA	0.0E+00	Blood	2.3E-02	NA	3.0E-03	2.6E-02
Chemical Total				6.9E-06	NA	3.0E-06	9.8E-06		2.1E-01	NA	1.4E-01	3.6E-01
Medium Total							9.8E-06					3.6E-01
Receptor Total							9.8E-06				Receptor HI Total	3.6E-01

* Surface and subsurface soil combined.

Total CNS HI Across All Media =	1.6E-02
Total Blood HI Across All Media =	6.2E-02
Total Skin HI Across All Media =	1.6E-01
Total Vascular HI Across All Media =	1.6E-01
Total NOAEL HI Across All Media =	2.3E-02
Total Kidney HI Across All Media =	6.4E-02
Total Immune System HI Across All Media =	3.6E-03
Total Gastrointestinal HI Across All Media =	2.6E-02
Total Liver HI Across All Media =	2.1E-03
Total Whole Body HI Across All Media =	8.3E-04
Total Hair HI Across All Media =	2.1E-03

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Site 28 Soil*	Benzo(a)pyrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			n-Nitroso-di-n-propylamine	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	2.3E-03	NA	1.8E-04	2.5E-03
			Antimony	NA	NA	NA	0.0E+00	Blood	4.7E-04	NA	2.5E-04	7.2E-04
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	2.3E-02	NA	5.6E-03	2.9E-02
			Barium	NA	NA	NA	0.0E+00	NOAEL	3.2E-04	NA	3.6E-04	6.8E-04
			Cadmium	NA	NA	NA	0.0E+00	Kidney	7.2E-04	NA	2.3E-04	9.5E-04
			Chromium	NA	NA	NA	0.0E+00	NOAEL	1.5E-03	NA	4.8E-03	6.2E-03
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	2.2E-04	NA	1.8E-05	2.4E-04
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	1.7E-02	NA	1.4E-03	1.8E-02
			Manganese	NA	NA	NA	0.0E+00	CNS	1.6E-03	NA	3.1E-03	4.7E-03
			Mercury	NA	NA	NA	0.0E+00	Immune System	9.1E-05	NA	1.0E-04	1.9E-04
			Nickel	NA	NA	NA	0.0E+00	Whole Body	1.2E-04	NA	2.5E-04	3.7E-04
			Thallium	NA	NA	NA	0.0E+00	Liver, Blood, Hair	2.4E-03	NA	1.9E-04	2.5E-03
			Vanadium	NA	NA	NA	0.0E+00	Kidney	8.5E-03	NA	2.6E-02	3.5E-02
			Zinc	NA	NA	NA	0.0E+00	Blood	7.5E-04	NA	6.0E-05	8.1E-04
Chemical Total				NA	NA	NA	0.0E+00		5.9E-02	NA	4.3E-02	1.0E-01
Medium Total							0.0E+00					1.0E-01

TABLE 9.1.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	bis(2-Ethylhexyl)phthalate	NA	NA	NA	0.0E+00	Liver	4.1E-02	NA	5.9E-02	1.0E-01
			Aluminum	NA	NA	NA	0.0E+00	CNS	1.1E-01	NA	3.4E-04	1.1E-01
			Antimony	NA	NA	NA	0.0E+00	Blood	2.5E-01	NA	8.1E-04	2.5E-01
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	5.2E+00	NA	1.7E-02	5.3E+00
			Cadmium	NA	NA	NA	0.0E+00	Kidney	2.6E-02	NA	1.7E-03	2.8E-02
			Chromium	NA	NA	NA	0.0E+00	NOAEL	5.9E-02	NA	1.5E-02	7.4E-02
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	6.4E-01	NA	2.0E-03	6.4E-01
			Manganese	NA	NA	NA	0.0E+00	CNS	2.3E-01	NA	1.9E-02	2.5E-01
			Vanadium	NA	NA	NA	0.0E+00	Kidney	3.1E-01	NA	9.8E-04	3.1E-01
			Zinc	NA	NA	NA	0.0E+00	Blood	3.5E-02	NA	6.7E-05	3.5E-02
Chemical Total				NA	NA	NA	0.0E+00		6.9E+00	NA	1.2E-01	7.0E+00
Medium Total							0.0E+00					7.0E+00
Receptor Total							0.0E+00				Receptor HI Total	7.1E+00

* Surface and subsurface soil combined.

Total CNS HI Across All Media =	3.7E-01
Total Blood HI Across All Media =	2.9E-01
Total Skin HI Across All Media =	5.3E+00
Total Vascular HI Across All Media =	5.3E+00
Total NOAEL HI Across All Media =	8.1E-02
Total Kidney HI Across All Media =	3.7E-01
Total Immune System HI Across All Media =	1.9E-04
Total Gastrointestinal HI Across All Media =	6.6E-01
Total Liver HI Across All Media =	1.0E-01
Total Whole Body HI Across All Media =	3.7E-04
Total Hair HI Across All Media =	2.5E-03

TABLE 9.2.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Site 28 Soil*	Benzo(a)pyrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			n-Nitroso-di-n-propylamine	NA	NA	NA	0.0E+00	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	2.1E-02	NA	1.2E-03	2.3E-02
			Antimony	NA	NA	NA	0.0E+00	Blood	4.4E-03	NA	1.6E-03	6.0E-03
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	2.2E-01	NA	3.6E-02	2.5E-01
			Barium	NA	NA	NA	0.0E+00	NOAEL	3.0E-03	NA	2.4E-03	5.3E-03
			Cadmium	NA	NA	NA	0.0E+00	Kidney	6.7E-03	NA	1.5E-03	8.2E-03
			Chromium	NA	NA	NA	0.0E+00	NOAEL	1.4E-02	NA	3.1E-02	4.5E-02
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	2.1E-03	NA	1.2E-04	2.2E-03
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	1.6E-01	NA	8.9E-03	1.7E-01
			Manganese	NA	NA	NA	0.0E+00	CNS	1.5E-02	NA	2.0E-02	3.5E-02
			Mercury	NA	NA	NA	0.0E+00	Immune System	8.5E-04	NA	6.8E-04	1.5E-03
			Nickel	NA	NA	NA	0.0E+00	Whole Body	1.2E-03	NA	1.6E-03	2.8E-03
			Thallium	NA	NA	NA	0.0E+00	Liver, Blood, Hair	2.2E-02	NA	1.2E-03	2.3E-02
			Vanadium	NA	NA	NA	0.0E+00	Kidney	8.0E-02	NA	1.7E-01	2.5E-01
			Zinc	NA	NA	NA	0.0E+00	Blood	7.0E-03	NA	3.9E-04	7.4E-03
Chemical Total				NA	NA	NA	0.0E+00		5.5E-01	NA	2.8E-01	8.3E-01
Medium Total							0.0E+00					8.3E-01

TABLE 9.2.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	bis(2-Ethylhexyl)phthalate	NA	NA	NA	0.0E+00	Liver	1.0E-01	NA	1.2E-01	2.2E-01
			Aluminum	NA	NA	NA	0.0E+00	CNS	2.6E-01	NA	7.7E-04	2.6E-01
			Antimony	NA	NA	NA	0.0E+00	Blood	9.3E-02	NA	1.8E-03	9.5E-02
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	1.3E+01	NA	3.8E-02	1.3E+01
			Cadmium	NA	NA	NA	0.0E+00	Kidney	6.5E-02	NA	3.8E-03	6.9E-02
			Chromium	NA	NA	NA	0.0E+00	NOAEL	1.4E-01	NA	3.4E-02	1.8E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	1.6E+00	NA	4.6E-03	1.6E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	5.8E-01	NA	4.2E-02	6.2E-01
			Vanadium	NA	NA	NA	0.0E+00	Kidney	7.6E-01	NA	8.6E-02	8.4E-01
			Zinc	NA	NA	NA	0.0E+00	Blood	8.6E-02	NA	1.5E-04	8.6E-02
Chemical Total				NA	NA	NA	0.0E+00		1.7E+01	NA	3.3E-01	1.7E+01
Medium Total							0.0E+00					1.7E+01
Receptor Total							0.0E+00				Receptor HI Total	1.8E+01

* Surface and subsurface soil combined.

Total CNS HI Across All Media =	9.4E-01
Total Blood HI Across All Media =	2.2E-01
Total Skin HI Across All Media =	1.3E+01
Total Vascular HI Across All Media =	1.3E+01
Total NOAEL HI Across All Media =	2.3E-01
Total Kidney HI Across All Media =	1.2E+00
Total Immune System HI Across All Media =	1.5E-03
Total Gastrointestinal HI Across All Media =	1.7E+00
Total Liver HI Across All Media =	2.4E-01
Total Whole Body HI Across All Media =	2.8E-03
Total Hair HI Across All Media =	2.3E-02

TABLE 9.3.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Site 28 Soil*	Benzo(a)pyrene	5.2E-07	NA	4.0E-07	9.3E-07	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	5.3E-08	NA	4.1E-08	9.4E-08	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	7.0E-07	NA	5.4E-07	1.2E-06	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	5.4E-08	NA	4.2E-08	9.6E-08	NA	NA	NA	NA	0.0E+00
			n-Nitroso-di-n-propylamine	3.0E-07	NA	1.8E-07	4.7E-07	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	NA	NA	NA	0.0E+00
			Antimony	NA	NA	NA	0.0E+00	Blood	NA	NA	NA	0.0E+00
			Arsenic	9.7E-06	NA	1.7E-06	1.1E-05	Skin, Vascular	NA	NA	NA	0.0E+00
			Barium	NA	NA	NA	0.0E+00	NOAEL	NA	NA	NA	0.0E+00
			Cadmium	NA	NA	NA	0.0E+00	Kidney	NA	NA	NA	0.0E+00
			Chromium	NA	NA	NA	0.0E+00	NOAEL	NA	NA	NA	0.0E+00
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	NA	NA	NA	0.0E+00
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	NA	NA	NA	0.0E+00
			Mercury	NA	NA	NA	0.0E+00	Immune System	NA	NA	NA	0.0E+00
			Nickel	NA	NA	NA	0.0E+00	Whole Body	NA	NA	NA	0.0E+00
			Thallium	NA	NA	NA	0.0E+00	Liver, Blood, Hair	NA	NA	NA	0.0E+00
			Vanadium	NA	NA	NA	0.0E+00	Kidney	NA	NA	NA	0.0E+00
			Zinc	NA	NA	NA	0.0E+00	Blood	NA	NA	NA	0.0E+00
Chemical Total				1.1E-05	NA	2.9E-06	1.4E-05		NA	NA	NA	0.0E+00
Medium Total							1.4E-05					0.0E+00

TABLE 9.3.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	bis(2-Ethylhexyl)phthalate	3.9E-06	NA	4.9E-06	8.8E-06	Liver	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	NA	NA	NA	0.0E+00
			Antimony	NA	NA	NA	0.0E+00	Blood	NA	NA	NA	0.0E+00
			Arsenic	8.1E-04	NA	2.4E-06	8.1E-04	Skin, Vascular	NA	NA	NA	0.0E+00
			Cadmium	NA	NA	NA	0.0E+00	Kidney	NA	NA	NA	0.0E+00
			Chromium	NA	NA	NA	0.0E+00	NOAEL	NA	NA	NA	0.0E+00
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	NA	NA	NA	0.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	NA	NA	NA	0.0E+00
			Vanadium	NA	NA	NA	0.0E+00	Kidney	NA	NA	NA	0.0E+00
			Zinc	NA	NA	NA	0.0E+00	Blood	NA	NA	NA	0.0E+00
Chemical Total				8.1E-04	NA	7.4E-06	8.2E-04		0.0E+00	NA	0.0E+00	0.0E+00
Medium Total							8.2E-04					0.0E+00
Receptor Total							8.3E-04				Receptor HI Total	0.0E+00

* Surface and subsurface soil combined.

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Site 28 Soil*	Benzo(a)pyrene	1.5E-08	NA	6.5E-09	2.2E-08	NA	NA	NA	NA	0.0E+00
			Benzo(b)fluoranthene	1.5E-09	NA	6.6E-10	2.2E-09	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	2.0E-08	NA	8.7E-09	2.9E-08	NA	NA	NA	NA	0.0E+00
			Indeno(1,2,3-cd)pyrene	1.6E-09	NA	6.7E-10	2.2E-09	NA	NA	NA	NA	0.0E+00
			n-Nitroso-di-n-propylamine	8.6E-09	NA	2.8E-09	1.1E-08	NA	NA	NA	NA	0.0E+00
			Aluminum	NA	NA	NA	0.0E+00	CNS	4.3E-03	NA	1.4E-04	4.4E-03
			Antimony	NA	NA	NA	0.0E+00	Blood	8.8E-04	NA	1.9E-04	1.1E-03
			Arsenic	2.8E-07	NA	2.8E-08	3.1E-07	Skin, Vascular	4.4E-02	NA	4.3E-03	4.8E-02
			Barium	NA	NA	NA	0.0E+00	NOAEL	5.9E-04	NA	2.8E-04	8.8E-04
			Cadmium	NA	NA	NA	0.0E+00	Kidney	1.3E-03	NA	1.8E-04	1.5E-03
			Chromium	NA	NA	NA	0.0E+00	NOAEL	4.2E-04	NA	5.5E-04	9.7E-04
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	4.2E-04	NA	1.4E-05	4.3E-04
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	3.2E-02	NA	1.1E-03	3.3E-02
			Manganese	NA	NA	NA	0.0E+00	CNS	2.9E-03	NA	2.4E-03	5.3E-03
			Mercury	NA	NA	NA	0.0E+00	Immune System	1.7E-04	NA	8.0E-05	2.5E-04
			Nickel	NA	NA	NA	0.0E+00	Whole Body	2.3E-04	NA	1.9E-04	4.2E-04
			Thallium	NA	NA	NA	0.0E+00	Liver, Blood, Hair	4.4E-03	NA	1.5E-04	4.6E-03
			Vanadium	NA	NA	NA	0.0E+00	Kidney	1.6E-02	NA	2.0E-02	3.6E-02
			Zinc	NA	NA	NA	0.0E+00	Blood	1.4E-03	NA	4.6E-05	1.5E-03
Chemical Total				3.3E-07	NA	4.7E-08	3.7E-07		1.1E-01	NA	3.0E-02	1.4E-01
Medium Total							3.7E-07					1.4E-01

TABLE 9.4.CTE
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
CENTRAL TENDENCY EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water	Aluminum	NA	NA	NA	0.0E+00	CNS	NA	NA	2.2E-03	2.2E-03
			Antimony	NA	NA	3.0E-07	3.0E-07	Blood	NA	NA	4.6E-02	4.6E-02
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	NA	NA	4.6E-03	4.6E-03
			Cadmium	NA	NA	NA	0.0E+00	Kidney	NA	NA	6.2E-03	6.2E-03
			Chromium	NA	NA	NA	0.0E+00	NOAEL	NA	NA	5.6E-03	5.6E-03
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	NA	NA	1.0E-01	1.0E-01
			Vanadium	NA	NA	3.0E-07	3.0E-07	Kidney	NA	NA	1.7E-01	1.7E-01
			Zinc	NA	NA	3.0E-07	3.0E-07	Blood	NA	NA	1.7E-01	1.7E-01
Chemical Total				NA	NA	8.9E-07	8.9E-07		NA	NA	5.1E-01	5.1E-01
Medium Total							8.9E-07					5.1E-01
Receptor Total							1.3E-06				Receptor HI Total	6.5E-01

* Surface and subsurface soil combined.

Total CNS HI Across All Media =	1.2E-02
Total Blood HI Across All Media =	2.2E-01
Total Skin HI Across All Media =	5.2E-02
Total Vascular HI Across All Media =	5.2E-02
Total NOAEL HI Across All Media =	7.5E-03
Total Kidney HI Across All Media =	2.1E-01
Total Immune System HI Across All Media =	2.5E-04
Total Gastrointestinal HI Across All Media =	1.4E-01
Total Liver HI Across All Media =	4.6E-03
Total Whole Body HI Across All Media =	4.2E-04
Total Hair HI Across All Media =	4.6E-03

TABLE 10.1.RME
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Site 28 Soil*										
			Antimony	NA	NA	NA	0.0E+00	Blood	8.8E-02	NA	2.3E-02	1.1E-01
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	5.7E-01	NA	6.8E-02	6.3E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	1.0E-01	NA	4.1E-03	1.1E-01
			Zinc	NA	NA	NA	0.0E+00	Blood	1.1E-01	NA	4.5E-03	1.2E-01
Chemical Total				NA	NA	NA	0.0E+00		8.7E-01	NA	1.0E-01	9.7E-01
Medium Total							0.0E+00					9.7E-01
Groundwater	Groundwater	Tap Water										
			Aluminum	NA	NA	NA	0.0E+00	CNS	4.7E-01	NA	2.5E-03	4.8E-01
			Antimony	NA	NA	NA	0.0E+00	Blood	2.1E-01	NA	7.4E-03	2.2E-01
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	8.5E+00	NA	4.5E-02	8.6E+00
			Cadmium	NA	NA	NA	0.0E+00	Kidney	5.5E-01	NA	5.7E-02	6.1E-01
			Chromium	NA	NA	NA	0.0E+00	NOAEL	2.1E-01	NA	8.9E-02	3.0E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	6.0E+00	NA	3.1E-02	6.0E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	6.0E-01	NA	7.8E-02	6.8E-01
			Vanadium	NA	NA	NA	0.0E+00	Kidney	1.1E+00	NA	2.1E-01	1.3E+00
			Zinc	NA	NA	NA	0.0E+00	Blood	1.1E-01	NA	3.5E-04	1.1E-01
Chemical Total				NA	NA	NA	0.0E+00		1.8E+01	NA	5.2E-01	1.8E+01
Groundwater	Air	Water Vapors at Showerhead	Carbon tetrachlonde	NA	0.0E+00	NA	0.0E+00	Liver	NA	2.6E-02	NA	2.6E-02
Chemical Total				NA	NA	NA	0.0E+00		NA	2.6E-02	NA	2.6E-02
Medium Total							0.0E+00					1.8E+01
Receptor Total							0.0E+00				Receptor HI Total	1.9E+01

* Surface and subsurface soil combined.

Total CNS HI Across All Media =	1.2E+00
Total Blood HI Across All Media =	5.6E-01
Total Skin HI Across All Media =	9.2E+00
Total Vascular HI Across All Media =	9.2E+00
Total NOAEL HI Across All Media =	3.0E-01
Total Kidney HI Across All Media =	1.9E+00
Total Gastrointestinal HI Across All Media =	6.1E+00
Total Liver HI Across All Media =	2.6E-02

TABLE 10.2.RME
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Site 28 Soil*										
			Antimony	NA	NA	NA	0.0E+00	Blood	8.2E-01	NA	1.5E-01	9.7E-01
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	5.3E+00	NA	4.4E-01	5.7E+00
			Barium	NA	NA	NA	0.0E+00	NOAEL	7.2E-02	NA	2.9E-02	1.0E-01
			Cadmium	NA	NA	NA	0.0E+00	Kidney	5.7E-01	NA	6.3E-02	6.3E-01
			Chromium	NA	NA	NA	0.0E+00	NOAEL	1.4E-01	NA	1.5E-01	2.9E-01
			Copper	NA	NA	NA	0.0E+00	Gastrointestinal	1.1E-01	NA	3.1E-03	1.1E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	9.6E-01	NA	2.7E-02	9.8E-01
			Manganese	NA	NA	NA	0.0E+00	CNS	1.5E-01	NA	1.0E-01	2.5E-01
			Vanadium	NA	NA	NA	0.0E+00	Kidney	3.4E-01	NA	3.7E-01	7.1E-01
			Zinc	NA	NA	NA	0.0E+00	Blood	1.0E+00	NA	2.9E-02	1.1E+00
Chemical Total				NA	NA	NA	0.0E+00		9.5E+00	NA	1.4E+00	1.1E+01
Medium Total							0.0E+00					1.1E+01
Groundwater	Groundwater	Tap Water										
			Carbon tetrachloride	NA	NA	NA	0.0E+00	Liver	9.1E-02	NA	2.4E-02	1.1E-01
			Aluminum	NA	NA	NA	0.0E+00	CNS	1.1E+00	NA	7.3E-03	1.1E+00
			Antimony	NA	NA	NA	0.0E+00	Blood	5.0E-01	NA	2.2E-02	5.2E-01
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	2.0E+01	NA	1.3E-01	2.0E+01
			Cadmium	NA	NA	NA	0.0E+00	Kidney	1.3E+00	NA	1.7E-01	1.4E+00
			Chromium	NA	NA	NA	0.0E+00	NOAEL	5.0E-01	NA	2.6E-01	7.6E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	1.4E+01	NA	9.2E-02	1.4E+01
			Manganese	NA	NA	NA	0.0E+00	CNS	1.4E+00	NA	2.3E-01	1.6E+00
			Vanadium	NA	NA	NA	0.0E+00	Kidney	2.5E+00	NA	6.3E-01	3.1E+00
			Zinc	NA	NA	NA	0.0E+00	Blood	2.6E-01	NA	1.0E-03	2.6E-01
Chemical Total				NA	NA	NA	0.0E+00		4.1E+01	NA	1.6E+00	4.3E+01
Medium Total							0.0E+00					4.3E+01
Receptor Total							0.0E+00				Receptor HI Total	5.4E+01

* Surface and subsurface soil combined.

Total CNS HI Across All Media =	3.0E+00
Total Blood HI Across All Media =	2.8E+00
Total Skin HI Across All Media =	2.6E+01
Total Vascular HI Across All Media =	2.6E+01
Total NOAEL HI Across All Media =	1.2E+00
Total Kidney HI Across All Media =	5.9E+00
Total Gastrointestinal HI Across All Media =	1.5E+01
Total Liver HI Across All Media =	1.1E-01

TABLE 10.3.RME
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Site 28 Soil*	Benzo(a)pyrene	3.4E-06	NA	1.4E-06	4.7E-06	NA	NA	NA	NA	0.0E+00
			Dibenz(a,h)anthracene	3.4E-06	NA	1.4E-06	4.8E-06	NA	NA	NA	NA	0.0E+00
			n-Nitroso-di-n-propylamine	1.1E-06	NA	3.5E-07	1.4E-06	NA	NA	NA	NA	0.0E+00
			Arsenic	2.9E-04	NA	2.8E-05	3.2E-04	Skin, Vascular	NA	NA	NA	0.0E+00
Chemical Total				3.0E-04	NA	3.1E-05	3.3E-04		0.0E+00	NA	0.0E+00	0.0E+00
Medium Total							3.3E-04					0.0E+00
Groundwater	Groundwater	Tap Water	Carbon tetrachloride	1.9E-06	NA	5.1E-07	2.5E-06	Liver	NA	NA	NA	0.0E+00
			Arsenic	2.1E-03	NA	1.2E-05	2.1E-03	Skin, Vascular	NA	NA	NA	0.0E+00
Chemical Total				NA	NA	NA	2.1E-03		0.0E+00	NA	0.0E+00	0.0E+00
Medium Total							2.1E-03					0.0E+00
Receptor Total							2.4E-03				Receptor HI Total	0.0E+00

* Surface and subsurface soil combined.

TABLE 10.4.RME
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Construction Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Site 28 Soil*										
			Antimony	NA	NA	NA	0.0E+00	Blood	3.0E-01	NA	4.1E-02	3.4E-01
			Arsenic	1.2E-05	NA	7.7E-07	1.3E-05	Skin, Vascular	1.9E+00	NA	1.2E-01	2.1E+00
			Cadmium	NA	NA	NA	0.0E+00	Kidney	2.1E-01	NA	1.7E-02	2.2E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	3.5E-01	NA	7.2E-03	3.6E-01
			Vanadium	NA	NA	NA	0.0E+00	Kidney	1.2E-01	NA	9.9E-02	2.2E-01
			Zinc	NA	NA	NA	0.0E+00	Blood	3.8E-01	NA	7.9E-03	3.9E-01
Chemical Total				1.2E-05	NA	7.7E-07	1.3E-05		3.3E+00	NA	2.9E-01	3.6E+00
Medium Total							1.3E-05					3.6E+00
Groundwater	Groundwater	Tap Water										
			Arsenic	NA	NA	7.5E-07	7.5E-07	Skin, Vascular	NA	NA	1.2E-01	1.2E-01
			Manganese	NA	NA	NA	0.0E+00	CNS	NA	NA	1.1E-01	1.1E-01
			Vanadium	NA	NA	NA	0.0E+00	Kidney	NA	NA	2.0E-01	2.0E-01
			Zinc	NA	NA	NA	0.0E+00	Blood	NA	NA	7.1E-01	7.1E-01
Chemical Total				NA	NA	NA	7.5E-07		0.0E+00	NA	1.1E+00	1.1E+00
Medium Total							7.5E-07					1.1E+00
Receptor Total							1.4E-05				Receptor HI Total	4.7E+00

* Surface and subsurface soil combined.

Total CNS HI Across All Media =	1.1E-01
Total Blood HI Across All Media =	1.4E+00
Total Skin HI Across All Media =	2.2E+00
Total Vascular HI Across All Media =	2.2E+00
Total Kidney HI Across All Media =	6.5E-01
Total Gastrointestinal HI Across All Media =	3.6E-01

TABLE 10.5.RME

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

Site 28 IHDIV-NSWC

Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Trespasser
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Site 28 Soil*	Arsenic	1.3E-05	NA	6.7E-06	2.0E-05	Skin, Vascular	8.4E-02	NA	4.3E-02	1.3E-01
Chemical Total				1.3E-05	NA	6.7E-06	2.0E-05		8.4E-02	NA	4.3E-02	1.3E-01
Medium Total							2.0E-05					1.3E-01
Receptor Total							2.0E-05				Receptor HI Total	1.3E-01

* Surface and subsurface soil combined.

Total Skin HI Across All Media =	1.3E-01
Total Vascular HI Across All Media =	1.3E-01

TABLE 10.1.CTE
RISK SUMMARY
CENTRAL TENDENCY EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe:	Future
Receptor Population:	Resident
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Tap Water										
			Antimony	NA	NA	NA	0.0E+00	Blood	3.1E-01	NA	9.8E-04	3.1E-01
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	1.2E+00	NA	3.9E-03	1.2E+00
			Cadmium	NA	NA	NA	0.0E+00	Kidney	1.8E-01	NA	1.2E-02	1.9E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	9.1E-01	NA	2.9E-03	9.1E-01
			Manganese	NA	NA	NA	0.0E+00	CNS	1.9E-01	NA	1.5E-02	2.0E-01
			Vanadium	NA	NA	NA	0.0E+00	Kidney	2.4E-01	NA	7.7E-04	2.4E-01
Chemical Total				NA	NA	NA	0.0E+00		2.6E+00	NA	1.9E-02	2.6E+00
Medium Total							0.0E+00					2.6E+00
Receptor Total							0.0E+00				Receptor HI Total	2.6E+00

Total Blood HI Across All Media =	3.1E-01
Total Skin HI Across All Media =	1.2E+00
Total Vascular HI Across All Media =	1.2E+00
Total Gastrointestinal HI Across All Media =	9.1E-01
Total CNS HI Across All Media =	2.0E-01
Total Kidney HI Across All Media =	2.4E-01

TABLE 10.2.CTE
RISK SUMMARY
CENTRAL TENDENCY EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Site 28 Soil*										
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	2.2E-01	NA	3.6E-02	2.5E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	1.6E-01	NA	8.9E-03	1.7E-01
Chemical Total				NA	NA	NA	0.0E+00		3.8E-01	NA	4.5E-02	4.2E-01
Medium Total							0.0E+00					4.2E-01
Groundwater	Groundwater	Tap Water										
			Aluminum	NA	NA	NA	0.0E+00	CNS	2.4E-01	NA	7.1E-04	2.4E-01
			Antimony	NA	NA	NA	0.0E+00	Blood	1.1E-01	NA	2.2E-03	1.2E-01
			Arsenic	NA	NA	NA	0.0E+00	Skin, Vascular	3.0E+00	NA	8.7E-03	3.0E+00
			Cadmium	NA	NA	NA	0.0E+00	Kidney	4.4E-01	NA	2.6E-02	4.7E-01
			Chromium	NA	NA	NA	0.0E+00	NOAEL	1.2E-01	NA	2.8E-02	1.5E-01
			Iron	NA	NA	NA	0.0E+00	Gastrointestinal	2.2E+00	NA	6.6E-03	2.3E+00
			Manganese	NA	NA	NA	0.0E+00	CNS	4.6E-01	NA	3.4E-02	4.9E-01
			Vanadium	NA	NA	NA	0.0E+00	Kidney	5.9E-01	NA	6.7E-02	6.6E-01
Chemical Total				NA	NA	NA	0.0E+00		7.2E+00	NA	1.7E-01	7.3E+00
Medium Total							0.0E+00					7.3E+00
Receptor Total							0.0E+00				Receptor HI Total	7.8E+00

* Surface and subsurface soil combined.

Total CNS HI Across All Media =	7.3E-01
Total Blood HI Across All Media =	1.2E-01
Total Skin HI Across All Media =	3.2E+00
Total Vascular HI Across All Media =	3.2E+00
Total NOAEL HI Across All Media =	1.5E-01
Total Kidney HI Across All Media =	1.1E+00
Total Gastrointestinal HI Across All Media =	2.4E+00

TABLE 10.3.CTE
RISK SUMMARY
CENTRAL TENDENCY EXPOSURE
Site 28 IHDIV-NSWC
Indian Head, Maryland

Scenario Timeframe: Future
Receptor Population: Resident
Receptor Age: Child/Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk				Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	Exposure Routes Total	Primary Target Organ(s)	Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil*	Soil*	Site 28 Soil*	Arsenic	9.7E-06	NA	1.7E-06	1.1E-05	Skin, Vascular	NA	NA	NA	0.0E+00
Chemical Total				9.7E-06	NA	1.7E-06	1.1E-05		0.0E+00	NA	0.0E+00	0.0E+00
Medium Total							1.1E-05					0.0E+00
Groundwater	Groundwater	Tap Water	Arsenic	1.9E-04	NA	5.6E-07	1.9E-04	Skin, Vascular	NA	NA	NA	0.0E+00
Chemical Total				1.9E-04	NA	5.6E-07	1.9E-04		0.0E+00	NA	0.0E+00	0.0E+00
Medium Total							1.9E-04					0.0E+00
Receptor Total							2.0E-04				Receptor HI Total	0.0E+00

* Surface and subsurface soil combined.

Appendix H
Lead Hot Spot Analysis

Table 1
Samples Included in Lead Hot Spot Analysis
Site 28 RI Report, NDWIH
Indian Head, Maryland

StationID	IS28MM06		IS28MM11			IS28MM14	
SampleID	IS28SS06-0001	IS28SB06-0103	IS28SS11-0001	IS28SS11-0001P	IS28SB11-0103	IS28SS14-0001	IS28SB14-0103
SampleDate	05/15/03	05/15/03	05/13/03	05/13/03	05/13/03	05/15/03	05/15/03
Total Metals (MG/KG)							
Lead	430	15	731	836	14.1	189	1090

StationID	IS28MM23		IS28MM42		IS28SO08		
SampleID	IS28SS23-0001	IS28SB23-0103	IS28SS42-0001	IS28SB42-0103	IS28SS08-0001	IS28SB08-0103	
SampleDate	05/15/03	05/15/03	05/14/03	05/14/03	05/13/03	05/13/03	
Total Metals (MG/KG)							
Lead	346	1020	2800	410	3540 J	6	J

StationID	IS28SO09		IS28SO10			IS28SO15		
SampleID	IS28SS09-0001	IS28SB09-0103	IS28SS10-0001	IS28SB10-0103		IS28SS15-0001	IS28SB15-0103	
SampleDate	05/12/03	05/12/03	05/13/03	05/13/03		05/13/03	05/13/03	
Total Metals (MG/KG)								
Lead	526	3.7	1180	J	1640 J	3650	J	28.2 J

StationID	IS28SO18		IS28SO19		
SampleID	IS28SS18-0001	IS28SB18-0103	IS28SS19-0001	IS28SB19-0105	
SampleDate	05/13/03	05/13/03	05/13/03	05/13/03	
Total Metals (MG/KG)					
Lead	1990	149	10300 J	16600	J

Mean Value: 2125.59

J - Estimated

IEUBK Model Results

Indian Head Site 28 - Lead Hot Spot Analysis

Model Version: 1.0 Build 253
User Name:
Date:
Site Name:
Operable Unit:
Run Mode: Research

The time step used in this model run: 3 - Hourly (24 times a day).

****** Air ******

Indoor Air Pb Concentration: 30.000 percent of outdoor.
Other Air Parameters:

Age	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Lung Absorption (%)	Outdoor Air Pb Conc (ug Pb/m^3)
.5-1	1.000	2.000	32.000	0.100
1-2	2.000	3.000	32.000	0.100
2-3	3.000	5.000	32.000	0.100
3-4	4.000	5.000	32.000	0.100
4-5	4.000	5.000	32.000	0.100
5-6	4.000	7.000	32.000	0.100
6-7	4.000	7.000	32.000	0.100

****** Diet ******

Age	Diet Intake(ug/day)
.5-1	5.530
1-2	5.780
2-3	6.490
3-4	6.240
4-5	6.010
5-6	6.340
6-7	7.000

****** Drinking Water ******

Water Consumption:

Age	Water (L/day)
.5-1	0.200
1-2	0.500
2-3	0.520
3-4	0.530
4-5	0.550
5-6	0.580
6-7	0.590

Drinking Water Concentration: 4.000 ug Pb/L

****** Soil & Dust ******

Multiple Source Analysis Used
Average multiple source concentration: 1498.200 ug/g

Mass fraction of outdoor soil to indoor dust conversion factor: 0.700
Outdoor airborne lead to indoor household dust lead concentration: 100.000
Use alternate indoor dust Pb sources? No

Age	Soil (ug Pb/g)	House Dust (ug Pb/g)
.5-1	2126.000	1498.200

2-3	2126.000	1498.200
3-4	2126.000	1498.200
4-5	2126.000	1498.200
5-6	2126.000	1498.200
6-7	2126.000	1498.200

****** Alternate Intake ******

Age	Alternate (ug Pb/day)
.5-1	0.000
1-2	0.000
2-3	0.000
3-4	0.000
4-5	0.000
5-6	0.000
6-7	0.000

****** Maternal Contribution: Infant Model ******

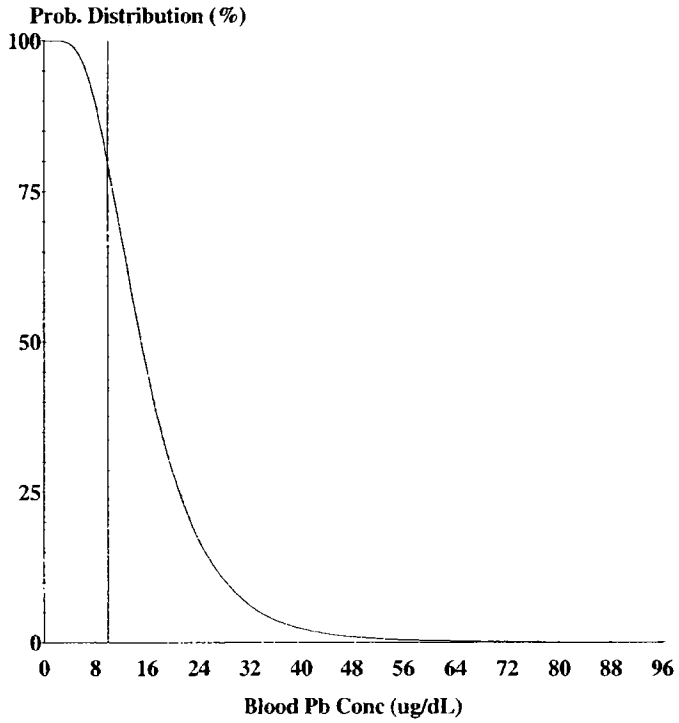
Maternal Blood Concentration: 2.500 ug Pb/dL

****
CALCULATED BLOOD LEAD AND LEAD UPTAKES:
****

Year	Air (ug/dL)	Diet (ug/day)	Alternate (ug/day)	Water (ug/day)
.5-1	0.021	1.871	0.000	0.271
1-2	0.034	1.849	0.000	0.640
2-3	0.062	2.176	0.000	0.697
3-4	0.067	2.186	0.000	0.743
4-5	0.067	2.331	0.000	0.853
5-6	0.093	2.563	0.000	0.938
6-7	0.093	2.894	0.000	0.976

Year	Soil+Dust (ug/day)	Total (ug/day)	Blood (ug/dL)
.5-1	30.719	32.881	16.8
1-2	46.134	48.657	19.4
2-3	48.351	51.285	18.4
3-4	50.529	53.525	18.0
4-5	41.443	44.695	15.4
5-6	38.867	42.461	13.2
6-7	37.546	41.509	11.8

Indian Head Site 28- Lead Hot Spot Analysis



Cutoff = 10.000 ug/dl
Geo Mean = 15.800
GSD = 1.600
% Above = 83.478

Age Range = 0 to 84 months
Time Step = Hourly
Run Mode = Research

Adult Lead Model Results

Calculations of Preliminary Remediation Goals (PRGs)

Indian Head Site 28
Utility Worker Exposure
Calculations of Blood Lead Concentrations (PbBs)
U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 05/19/03

Exposure Variable	PbB Equation*		Description of Exposure Variable	Units	Values for Non-Residential Exposure Scenario			
					Using Equation 1		Using Equation 2	
	1†	2**			GSD$_i$ = Hom	GSD$_i$ = Het	GSD$_i$ = Hom	GSD$_i$ = Het
PbS	X	X	Soil lead concentration	ug/g or ppm	2126	2126	2126	2126
$R_{fetal/maternal}$	X	X	Fetal/maternal PbB ratio	--	0.9	0.9	0.9	0.9
BKSF	X	X	Biokinetic Slope Factor	ug/dL per ug/day	0.4	0.4	0.4	0.4
GSD_i	X	X	Geometric standard deviation PbB	--	2.1	2.3	2.1	2.3
PbB_0	X	X	Baseline PbB	ug/dL	1.5	1.7	1.5	1.7
IR_S	X		Soil ingestion rate (including soil-derived indoor dust)	g/day	0.480	0.480	--	--
IR_{S+D}		X	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	0.480	0.480
W_S		X	Weighting factor: fraction of IR_{S+D} ingested as outdoor soil	--	--	--	1.0	1.0
K_{SD}		X	Mass fraction of soil in dust	--	--	--	0.7	0.7
$AF_{S,D}$	X	X	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12	0.12
$EF_{S,D}$	X	X	Exposure frequency (same for soil and dust)	days/yr	10	10	10	10
$AT_{S,D}$	X	X	Averaging time (same for soil and dust)	days/yr	365	365	365	365
PbB_{adult}	PbB of adult worker, geometric mean			ug/dL	2.8	3.0	2.8	3.0
$PbB_{fetal, 0.95}$	95th percentile PbB among fetuses of adult workers			ug/dL	8.7	10.8	8.7	10.8
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)			ug/dL	10.0	10.0	10.0	10.0
$P(PbB_{fetal} > PbB_t)$	Probability that fetal PbB > PbB_t, assuming lognormal distribution			%	3.3%	6.0%	3.3%	6.0%

† Equation 1 does not apportion exposure between soil and dust ingestion (excludes $W_S K_{SD}$).
When $IR_S = IR_{S+D}$ and $W_S = 1.0$, the equations yield the same $PbB_{fetal,0.95}$.

***Equation 1, based on Eq. 1, 2 in USEPA (1996).**

PbB_{adult} =	$(PbS*BKSF*IR_{S+D}*AF_{S,D}*EF_S/AT_{S,D}) + PbB_0$
$PbB_{fetal, 0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

****Equation 2, alternate approach based on Eq. 1, 2, and A-19 in USEPA (1996).**

PbB_{adult} =	$PbS*BKSF*([(IR_{S+D})*AF_S*EF_S*W_S]+[K_{SD}*(IR_{S+D})*(1-W_S)*AF_D*EF_D])/365+PbB_0$
$PbB_{fetal, 0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Preliminary Remediation Goals (PRGs)

Indian Head Site 28
Construction Worker Exposure
Calculations of Blood Lead Concentrations (PbBs)
U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 05/19/03

Exposure Variable	PbB Equation[1]		Description of Exposure Variable	Units	Values for Non-Residential Exposure Scenario *			
					Using Equation 1*		Using Equation 2**	
	1*	2**			GSDi = Hom	GSDi = Het	GSDi = Hom	GSDi = Het
PbS	X	X	Soil lead concentration	ug/g or ppm	2126	2126	2126	2126
$R_{fetal/maternal}$	X	X	Fetal/maternal PbB ratio	--	0.9	0.9	0.9	0.9
BKSF	X	X	Biokinetic Slope Factor	ug/dL per ug/day	0.4	0.4	0.4	0.4
GSD_i	X	X	Geometric standard deviation PbB	--	2.1	2.3	2.1	2.3
PbB_0	X	X	Baseline PbB	ug/dL	1.5	1.7	1.5	1.7
IR_S	X		Soil ingestion rate (including soil-derived indoor dust)	g/day	0.480	0.480	--	--
IR_{S+D}		X	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	0.480	0.480
W_S		X	Weighting factor, fraction of IR_{S+D} ingested as outdoor soil	--	--	--	1.0	1.0
K_{SD}		X	Mass fraction of soil in dust	--	--	--	0.7	0.7
$AF_{S,D}$	X	X	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12	0.12
$EF_{S,D}$	X	X	Exposure frequency (same for soil and dust)	days/yr	250	250	250	250
$AT_{S,D}$	X	X	Averaging time (same for soil and dust)	days/yr	365	365	365	365
PbB_{adult}	PbB of adult worker, geometric mean			ug/dL	35.1	35.3	35.1	35.3
$PbB_{fetal,0.95}$	95th percentile PbB among fetuses of adult workers			ug/dL	106.9	124.9	106.9	124.9
PbB_t	Target PbB level of concern (e.g., 10 ug/dL)			ug/dL	10.0	10.0	10.0	10.0
$P(PbB_{fetal} > PbB_t)$	Probability that fetal PbB > PbB_t, assuming lognormal distribution			%	93.9%	91.7%	93.9%	91.7%

[1] Equation 1 does not apportion exposure between soil and dust ingestion (excludes $W_S K_{SD}$).
When $IR_S = IR_{S+D}$ and $W_S = 1.0$, the equations yield the same $PbB_{fetal,0.95}$.

***Equation 1, based on Eq. 1, 2 in USEPA (1996).**

$PbB_{adult} =$	$(PbS*BKSF*IR_{S+D}*AF_{S,D}*EF_S/AT_{S,D}) + PbB_0$
$PbB_{fetal,0.95} =$	$PbB_{adult} * (GSD_i^{1.645} * R)$

****Equation 2, alternate approach based on Eq. 1, 2, and A-19 in USEPA (1996).**

$PbB_{adult} =$	$PbS*BKSF*([(IR_{S+D})*AF_S*EF_S*W_S]+[K_{SD}*(IR_{S+D})*(1-W_S)*AF_D*EF_D])/365+PbB_0$
$PbB_{fetal,0.95} =$	$PbB_{adult} * (GSD_i^{1.645} * R)$

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Preliminary Remediation Goals (PRGs)

Indian Head Site 28
Adult Trespasser Exposure
Calculations of Blood Lead Concentrations (PbBs)
U.S. EPA Technical Review Workgroup for Lead, Adult Lead Committee

Version date 05/19/03

Exposure Variable	PbB Equation* 1*	PbB Equation* 2**	Description of Exposure Variable	Units	Values for Non-Residential Exposure Scenario: Using Equation 1: GSD$_i$ = Hom	Using Equation 1: GSD$_i$ = Het	Using Equation 2: GSD$_i$ = Hom	Using Equation 2: GSD$_i$ = Het
PbS	X	X	Soil lead concentration	ug/g or ppm	2126	2126	2126	2126
$R_{fetal/maternal}$	X	X	Fetal/maternal PbB ratio	--	0.9	0.9	0.9	0.9
BKSF	X	X	Biokinetic Slope Factor	ug/dL per ug/day	0.4	0.4	0.4	0.4
GSD_i	X	X	Geometric standard deviation PbB	--	2.1	2.3	2.1	2.3
PbB_0	X	X	Baseline PbB	ug/dL	1.5	1.7	1.5	1.7
IR_S	X		Soil ingestion rate (including soil-derived indoor dust)	g/day	0.100	0.100	--	--
IR_{S+D}		X	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	0.100	0.100
W_S		X	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--	--	1.0	1.0
K_{SD}		X	Mass fraction of soil in dust	--	--	--	0.7	0.7
$AF_{S,D}$	X	X	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12	0.12
$EF_{S,D}$	X	X	Exposure frequency (same for soil and dust)	days/yr	52	52	52	52
$AT_{S,D}$	X	X	Averaging time (same for soil and dust)	days/yr	365	365	365	365
PbB_{adult}	**PbB of adult worker, geometric mean**			**ug/dL**	**3.0**	**3.2**	**3.0**	**3.2**
$PbB_{fetal,\ 0.95}$	**95th percentile PbB among fetuses of adult workers**			**ug/dL**	**9.0**	**11.2**	**9.0**	**11.2**
PbB_t	**Target PbB level of concern (e.g., 10 ug/dL)**			**ug/dL**	**10.0**	**10.0**	**10.0**	**10.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB > PbB_t, assuming lognormal distribution**			**%**	**3.7%**	**6.5%**	**3.7%**	**6.5%**

[1] Equation 1 does not apportion exposure between soil and dust ingestion (excludes W_S K_{SD}).
When $IR_S = IR_{S+D}$ and $W_S = 1.0$, the equations yield the same $PbB_{fetal,0.95}$.

***Equation 1, based on Eq. 1, 2 in USEPA (1996).**

PbB_{adult} =	$(PbS*BKSF*IR_{S+D}*AF_{S,D}*EF_S/AT_{S,D}) + PbB_0$
$PbB_{fetal,\ 0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

****Equation 2, alternate approach based on Eq. 1, 2, and A-19 in USEPA (1996).**

PbB_{adult} =	$PbS*BKSF*([(IR_{S+D})*AF_S*EF_S*W_S]+[K_{SD}*(IR_{S+D})*(1-W_S)*AF_D*EF_D])/365+PbB_0$
$PbB_{fetal,\ 0.95}$ =	$PbB_{adult} * (GSD_i^{1.645} * R)$

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Appendix I
Ecological Risk Assessment Tables

BTAG FAQ-Based Ecological Risk Assessment Screening Value Set for Use at EFA CHES Navy Sites in USEPA Region 3

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DATE: April 10, 2003

CH2MHILL has prepared the attached set of screening values under CTO-241 in accordance with the process provided in the document titled "USEPA Region III BTAG Frequently Asked Questions (FAQs)" (USEPA, 2002a). The FAQs document provides a list of preferred literature sources from which screening values can be obtained to supplement the current Region III BTAG screening value set (USEPA, 1995). The document does not promote replacement of existing BTAG values, except for updating Effects Range-Low (ER-L) values that are already a part of the Region III BTAG screening value set. The document also indicates that current federal Ambient Water Quality Criteria (AWQC) may be used as supplemental values. As these are regulatory-based criteria, their use as replacements for Region III BTAG values is also warranted.

Upon approval by EFA CHES, the attached set of screening values will be uniformly used in all new ecological risk assessments conducted by CH2MHILL at EFA CHES sites. Where a different screening value set is already in use at an individual EFA CHES Installation Restoration (IR) site or group of IR sites (e.g., watershed), a determination about whether to use the attached set for future evaluations at those sites will be made on a case-by-case basis.

The original scope under CTO-241 called for the creation of a screening value set that would be specific to Naval Air Station Patuxent River, utilizing a variety of sources to supplement the Region III BTAG values and replace outdated, erroneous, or non-toxicologically-based Region III BTAG values. The attached product is significantly different from that originally scoped in that it is geared largely toward compliance with Region III BTAG preferences expressed in USEPA (2002a), as opposed to development of an up-to-date "best available" set. An exception to this is the replacement of out-dated AWQC with current AWQC.

As currently planned with Neal Parker/EFA CHES, the second step in the process of developing a screening value set will be to prepare a second technical memorandum that provides the rationale for replacing up to a dozen existing Region III BTAG screening values. Values targeted for replacement may include those reported in error, those based on background, or those that simply can be improved upon because they are not based on the body of currently available literature.

The attached screening value set would be updated to reflect the replacement of values once those values have been accepted by the USEPA. As outlined in USEPA (2002a), the submittal of alternate screening value requests should adhere to the following criteria:

> *"Alternate values from other sources will be considered when the following criteria have been met:*
>
> 1. *a written justification supporting the use of the value is provided and approved by BTAG prior to the development and submission of the Screening Level Ecological Risk Assessment;*
> 2. *the value is based on a NOAEL;*
> 3. *citations for the studies that were evaluated during the development process are provided; and,*
> 4. *copies of the key references (e.g., journal article, unpublished research, etc.) supporting the use of the value are provided."*

Development of a Screening Value Set in Accordance with USEPA (2002a)

The existing Region III BTAG screening value set (USEPA, 1995) was supplemented as outlined in USEPA (2002a), which reads:

> *"As approved by BTAG, alternate values may be considered if they are from one of the following sources (cited in order of preference) and the source of the value is clearly cited:*
>
> 1. *USEPA AWQC;*
> 2. *NOAA SQuiRT values (current values may also be used to update the historical ER-L values previously used as a BTAG value);*
> 3. *USEPA EcoTox Thresholds;*
> 4. *Oak Ridge National Laboratory Screening Benchmarks (appropriate safety factors must be applied to values not based on "no effects" data); and,*
> 5. *USEPA Region IV Chronic Screening Values."*

According to this hierarchy, screening value tables were created for inorganics, pesticides, PCBs, and volatile and semivolatile organic compounds in soil, fresh water, freshwater sediment, salt water, and saltwater sediment (Tables 1 through 5). Each of the sources listed above was consulted for each medium.

For some media and chemicals, the existing Region III BTAG screening value set contains values for both fauna and flora. In cases where both a fauna and flora screening value was available for a chemical, the lower of the two values was selected (i.e., a subset of the Region III BTAG screening value set served as the starting point). Within Tables 1 through 5, supplemental values to this subset are identified with an "S." Replacement values, which

were all AWQC, are identified with an "R." The source of the screening values and their type are also identified in the tables.

The surface water and sediment screening value sets for estuarine environments (1 to 10 parts per thousand salinity) will be developed by taking the lower of the fresh water and salt water values.

The remaining text of this memorandum presents a review of the source documents from which USEPA (2002a) indicates supplemental values may be obtained. Available supplemental values are discussed by medium.

Table 1 - SOIL

1. **USEPA AWQC** - The USEPA AWQC (USEPA, 2002b) do not apply to soil.
2. **NOAA SQuiRT values** - No toxicologically-based soil screening values are provided in the NOAA SQuiRT table (Buchman, 1999). For soil, the only available data in the SQuiRT table are background concentrations.
3. **USEPA EcoTox Thresholds** - The EcoTox Thresholds (USEPA, 1996) apply only to sediment and surface water.
4. **Oak Ridge National Laboratory (ORNL) Screening Benchmarks** - ORNL Screening Benchmarks (ORNL, 1997a, 1997b) were used to supplement the Region III BTAG screening value set for soil (Table 1). Screening benchmarks for plants, earthworms, and microbes were used as supplements. If more than one type of benchmark was available for a chemical (e.g., nitrobenzene, which has screening values based on both earthworms and microbes), the lowest of the concentrations was chosen. Eight screening benchmarks selected from the ORNL Screening Benchmark sets were used as supplements in Table 1 (i.e., 1,1-biphenyl, di-n-butylphthalate, diethylphthalate, dimethyl phthalate, hexachlorobenzene, hexachlorocyclopentadiene, nitrobenzene, and n-nitrosodiphenylamine). The benchmarks were evaluated for source and those derived from EC_{50} data (1,1-biphenyl, diethylphthalate, dimethyl phthalate, hexachlorocyclopentadiene, nitrobenzene and n-nitrosodiphenylamine) were modified accordingly using a factor of 100 (as per Wentsel et al., 1996); these benchmarks are designated on Table 1 as S*.
5. **USEPA Region IV Chronic Screening Values** - One ecological screening value for soil (cyclohexane) was available from the Region IV screening value set (USEPA, 2000) to supplement the existing Region III BTAG screening value set.

Table 2 - FRESH WATER

1. **USEPA AWQC** - Fourteen Region III BTAG screening values based on historical AWQC values were replaced with current AWQC values reported by USEPA (2002b). AWQC values for each of the five hardness-dependent metals were calculated based on a hardness of 25 mg $CaCO_3$/L fresh water (see Attachment A for formulas). However,

site-specific hardness will be used to adjust these screening values when used in a risk assessment.

2. **NOAA SQuiRT values** – One fresh water Criteria Continuous Concentration (chronic) value (4-chloroaniline) was identified from the NOAA SQuiRT table for use in Table 2 as a supplemental fresh water screening value.

3. **USEPA EcoTox Thresholds** – Three Tier II fresh water screening values were identified from USEPA EcoTox Thresholds for use as supplemental fresh water screening values (i.e., 1,1-biphenyl, 4-bromophenyl-phenylether, and benzo(a)pyrene).

4. **Oak Ridge National Laboratory (ORNL) Screening Benchmarks** – Two Tier II fresh water chronic values from the ORNL Screening Benchmarks set (Suter and Tsao, 1996) were used to supplement the Region III BTAG set (i.e., 2-methylphenol and dibenzofuran).

5. **USEPA Region IV Chronic Screening Values** – Two chronic screening values from the Region IV screening value set were used to supplement the Region III BTAG screening value set (i.e., 2-nitrophenol and bis(2-chloroethyl)ether).

Table 3 – FRESHWATER SEDIMENT

1. **USEPA AWQC** – The USEPA AWQC do not apply to sediment.

2. **NOAA SQuiRT values** – Six freshwater sediment screening values were obtained from the NOAA SQuiRT table for use in Table 3 as supplemental freshwater sediment screening values. Multiple screening values are included in the NOAA SQuiRT table. The screening values for aluminum and iron are Lowest Assessment and Remediation of Contaminated Sediments (ARCS) (*H. azteca*) Threshold Effects Levels (TELs). The screening values for dieldrin, endrin, heptachlor epoxide, and lindane are TELs for freshwater sediment.

   The TEL is calculated as the geometric mean of the 15th percentile concentration of the toxic effects data set and the median of the no-effect data set; as such, it represents the concentration below which adverse effects are expected to occur only rarely. Alternatively, the Probable Effects Threshold (PEL), as the geometric mean of the 50th percentile of impacted, toxic samples and the 85th percentile of the non-impacted samples, is the level above which adverse effects are frequently expected.

   Upper Effects Thresholds (UETs), which are also presented in the NOAA SQuiRT table are derived by NOAA as the lowest Apparent Effects Threshold (AET). AETs relate chemical concentrations in sediments to biological indicators of injury (i.e., sediment bioassays or diminished benthic infaunal abundance). Individual AETs are essentially equivalent to the concentration observed in the highest non-toxic sample. As such, these represent the concentration above which adverse biological impacts would always be expected. Conversely, adverse impacts are known to occur at levels below the AET.

   Screening with conservative, lower-threshold values (e.g., TELs) ensures, with a high degree of confidence, that any contaminant sources eliminated from future

consideration pose no potential threat. However, only where TELs were not available, were the second tier, less conservative UETs used; two constituents, heptachlor and chlordane, had UETs listed on the NOAA SQuiRT table, and these were chosen as screening values (i.e., only after more conservative values were searched for in sources 3 through 5 below)

3. **USEPA EcoTox Thresholds** - None of the screening values in Table 3 were obtained from USEPA EcoTox Thresholds. It is CH2M HILL's understanding that Region III BTAG's preference is that equilibrium partitioning-based benchmarks not be used as screening values. The majority of the screening values in USEPA EcoTox Thresholds for sediment are equilibrium partitioning-based (sediment quality benchmarks (SQBs) and sediment quality criteria (SQCs)). These values were not selected as supplemental screening values in Table 3 or Table 5 (Saltwater Sediment). The only other screening values contained in USEPA EcoTox Thresholds are ER-Ls, which are also found in NOAA SQuiRTs.

4. **Oak Ridge National Laboratory (ORNL) Screening Benchmarks** - Screening values for five chemicals (i.e., manganese, aldrin, alpha-BHC, beta-BHC, and benzo(k)fluoranthene) were selected from ORNL Screening Benchmarks for sediment (ORNL, 1997c). Multiple screening value sets are included in the ORNL Screening Benchmarks document. Equilibrium partitioning-derived sediment quality benchmarks were not used. The value selected for manganese is an ARCS Threshold Effects Concentration (TEC). TECs were used first, if available because, like TELs, these are threshold effects concentrations, and are therefore more conservative than Probable Effects Concentrations (PECs) or No Effect Concentrations (NECs) (NECs are derived using the AET approach).

   The values for aldrin, alpha-BHC, beta-BHC, and benzo(k)fluoranthene are Ontario Ministry of Environment (OMOE) Lowest Effect Concentrations (LELs). OMOE LELs were chosen for use as supplemental values when TECs were not available. The LEL is the 5th percentile of the concentration-effect distribution and, as such, is comparable to an ER-L.

5. **USEPA Region IV Chronic Screening Values** - No supplemental screening values were identified in the Region IV screening value set.

Table 4 - SALT WATER

1. **USEPA AWQC** - Eight Region III BTAG screening values based on historical AWQC were replaced with current AWQC values (i.e., arsenic, cadmium, copper, lead, mercury, nickel, selenium, and zinc). The current AWQC value for gamma-chlordane was used to supplement the Region III BTAG set.

2. **NOAA SQuiRT values** - No supplemental screening values were identified in the NOAA SQuiRT table.

3. **USEPA EcoTox Thresholds** - None of the screening values in Table 4 were obtained from USEPA EcoTox Thresholds because the only salt water screening values in that set are AWQC values.

4. **Oak Ridge National Laboratory (ORNL) Screening Benchmarks** – None of the screening values in Table 4 were chosen from ORNL Screening Benchmarks because there are no salt water screening values in the set.

5. **USEPA Region IV Chronic Screening Values** – The Region IV chronic screening value for chloroform was used to supplement the Region III BTAG screening value set.

Table 5 - SALTWATER SEDIMENT

1. **USEPA AWQC** - The USEPA AWQC do not apply to sediment.

2. **NOAA SQuiRT values** – Two screening values were selected from the NOAA SQuiRT table to supplement the Region III BTAG screening value set. As for freshwater sediment, multiple screening values are included in the NOAA SQuiRT table. Values for dieldrin and lindane are TELs for marine sediment. Again, as with freshwater sediment, less conservative AETs were also included. Values for aluminum, barium, cobalt, iron, manganese, selenium, vanadium, aldrin, heptachlor, alpha-chlordane, 2,4,5-trichlorophenol, 2,4,6-trichlorophenol, 2,4-dichlorophenol, 2-chlorophenol, hexachloroethane, carbon tetrachloride, chlorobenzene, styrene and trichloroethene are AETs. AETs were only used after sources 3 through 5 were evaluated for more conservative screening values.

3. **USEPA EcoTox Thresholds** – No supplemental screening values were identified in USEPA EcoTox Thresholds (see Freshwater Sediment above).

4. **Oak Ridge National Laboratory (ORNL) Screening Benchmarks** – Multiple screening value sets are included in the ORNL Screening Benchmarks for sediment document. ER-Ls, updated and revised from Long et al. (1995), were chosen over TELs from the Florida Department of Environmental Protection (FDEP). ER-Ms and FDEP PELs were not used. Overall, there was one benchmark available to supplement the Region III BTAG screening value set. The value for endrin is an ER-L for marine sediment.

5. **USEPA Region IV Chronic Screening Values** - No supplemental screening values were identified in the Region IV screening value set.

Literature Cited

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Oak Ridge National Laboratory (ORNL). 1997b. *Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Soil and Litter Invertebrates and Heterotrophic Process: 1997 Revision.* November 1997.

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Suter and Tsao. 1996. *Toxicological Benchmarks for Screening of Potential Contaminants of Concern for Effects on Aquatic Biota on Oak Ride Reservation: 1996 Revision.*

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Table 1
Soil Screening Values

Chemical	Screening Value	Source of Screening Value	Type of Value	Replacement or Supplement	Can be Detected Below Screening
Inorganics (MG/KG)					
Aluminum	1.00	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Antimony	0.48	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Arsenic	328	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Barium	440	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Beryllium	0.020	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Cadmium	2.50	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Chromium	0.0075	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Cobalt	100	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Copper	15.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Cyanide	0.005	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Iron	12.0	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Lead	0.010	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Manganese	330	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Mercury	0.058	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Nickel	2.00	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Selenium	1.80	USEPA (1995)	USEPA Region III BTAG Screening Value		M
Silver	9.80E-06	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Thallium	0.0010	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Vanadium	0.50	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Zinc	10.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Pesticide/Polychlorinated Biphenyls (UG/KG)					
4,4'-DDD	100	USEPA (1995)	USEPA Region III BTAG Screening Value		A
4,4'-DDE	100	USEPA (1995)	USEPA Region III BTAG Screening Value		A
4,4'-DDT	100	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Aldrin	100	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Aroclor-1016	100	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Aroclor-1221	100	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Aroclor-1232	100	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Aroclor-1242	100	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Aroclor-1248	100	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Aroclor-1254	100	USEPA (1995)	USEPA Region III BTAG Screening Value		M
Aroclor-1260	100	USEPA (1995)	USEPA Region III BTAG Screening Value		M
Dieldrin	100	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Endosulfan I	NSV	NSV	NSV		
Endosulfan II	NSV	NSV	NSV		
Endosulfan sulfate	NSV	NSV	NSV		
Endrin	100	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Endrin aldehyde	100	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Endrin ketone	100	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Heptachlor	NSV	NSV	NSV		
Heptachlor epoxide	100	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Methoxychlor	100	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Toxaphene	NSV	NSV	NSV		
alpha-BHC	100,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
alpha-Chlordane	100	USEPA (1995)	USEPA Region III BTAG Screening Value		A
beta-BHC	100,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
delta-BHC	100,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
gamma-BHC (Lindane)	100	USEPA (1995)	USEPA Region III BTAG Screening Value		A
gamma-Chlordane	NSV	NSV	NSV		
Semivolatile Organic Compounds (UG/KG)					
1,1-Biphenyl	600	ORNL (1997A)	ORNL Soil Screening Benchmark (Phytotoxicity)	S*	A
2,2'-Oxybis(1-chloropropane)	NSV	NSV	NSV		
2,4,5-Trichlorophenol	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
2,4,6-Trichlorophenol	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
2,4-Dichlorophenol	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
2,4-Dimethylphenol	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
2,4-Dinitrophenol	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
2,4-Dinitrotoluene	NSV	NSV	NSV		
2,6-Dinitrotoluene	NSV	NSV	NSV		
2-Chloronaphthalene	NSV	NSV	NSV		
2-Chlorophenol	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
2-Methylnaphthalene	NSV	NSV	NSV		
2-Methylphenol	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
2-Nitroaniline	NSV	NSV	NSV		
2-Nitrophenol	NSV	NSV	NSV		
3,3'-Dichlorobenzidine	NSV	NSV	NSV		
3-Nitroaniline	NSV	NSV	NSV		
4,6-Dinitro-2-methylphenol	NSV	NSV	NSV		
4-Bromophenyl-phenylether	NSV	NSV	NSV		

NSV - No Screening Value

Table 1 Soil Screening Values					
Chemical	Screening Value	Source of Screening Value	Type of Value	Replacement or Supplement	Can be Detected Below Screening
4-Chloro-3-methylphenol	NSV	NSV	NSV		
4-Chloroaniline	NSV	NSV	NSV		
4-Chlorophenyl-phenylether	NSV	NSV	NSV		
4-Methylphenol	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
4-Nitroaniline	NSV	NSV	NSV		
4-Nitrophenol	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Acenaphthene	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Acenaphthylene	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Acetophenone	NSV	NSV	NSV		
Anthracene	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Atrazine	NSV	NSV	NSV		
Benzaldehyde	NSV	NSV	NSV		
Benzo(a)anthracene	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Benzo(a)pyrene	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Benzo(b)fluoranthene	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Benzo(g,h,i)perylene	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Benzo(k)fluoranthene	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Butylbenzylphthalate	NSV	NSV	NSV		
Caprolactam	NSV	NSV	NSV		
Carbazole	NSV	NSV	NSV		
Chrysene	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Di-n-butylphthalate	200,000	ORNL (1997A)	ORNL Soil Screening Benchmark (Phytotoxicity)	S	A
Di-n-octylphthalate	NSV	NSV	NSV		
Dibenz(a,h)anthracene	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Dibenzofuran	NSV	NSV	NSV		
Diethylphthalate	1,000	ORNL (1997A)	ORNL Soil Screening Benchmark (Phytotoxicity)	S*	A
Dimethyl phthalate	2,000	ORNL (1997B)	ORNL Soil Screening Benchmark (Earthworms)	S*	A
Fluoranthene	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Fluorene	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Hexachlorobenzene	1,000,000	ORNL (1997B)	ORNL Soil Screening Benchmark (Microbes)	S	A
Hexachlorobutadiene	NSV	NSV	NSV		
Hexachlorocyclopentadiene	100	ORNL (1997A)	ORNL Soil Screening Benchmark (Phytotoxicity)	S*	N
Hexachloroethane	NSV	NSV	NSV		
Indeno(1,2,3-cd)pyrene	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Isophorone	NSV	NSV	NSV		
Naphthalene	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Nitrobenzene	400	ORNL (1997B)	ORNL Soil Screening Benchmark (Earthworms)	S*	S
Pentachlorophenol	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Phenanthrene	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Phenol	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Pyrene	100	USEPA (1995)	USEPA Region III BTAG Screening Value		N
bis(2-Chloroethoxy)methane	NSV	NSV	NSV		
bis(2-Chloroethyl)ether	NSV	NSV	NSV		
bis(2-Ethylhexyl)phthalate	NSV	NSV	NSV		
n-Nitroso-di-n-propylamine	NSV	NSV	NSV		
n-Nitrosodiphenylamine	20,000	ORNL (1997B)	ORNL Soil Screening Benchmark (Earthworms)	S*	M
Volatile Organic Compounds (UG/KG)					
1,1,1-Trichloroethane	300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,1,2,2-Tetrachloroethane	300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NSV	NSV	NSV		
1,1,2-Trichloroethane	300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,1-Dichloroethane	300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,1-Dichloroethene	NSV	NSV	NSV		
1,2,4-Trichlorobenzene	100	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,2-Dibromo-3-chloropropane	NSV	NSV	NSV		
1,2-Dibromoethane	5,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,2-Dichlorobenzene	100	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,2-Dichloroethane	870,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,2-Dichloropropane	300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,3-Dichlorobenzene	NSV	NSV	NSV		
1,4-Dichlorobenzene	100	USEPA (1995)	USEPA Region III BTAG Screening Value		A
2-Butanone	NSV	NSV	NSV		
2-Hexanone	NSV	NSV	NSV		
4-Methyl-2-pentanone	100,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Acetone	NSV	NSV	NSV		
Benzene	100	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Bromodichloromethane	450,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Bromoform	1,147,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Bromomethane	NSV	NSV	NSV		
Carbon disulfide	NSV	NSV	NSV		

NSV - No Screening Value

Table 1 Soil Screening Values					
Chemical	Screening Value	Source of Screening Value	Type of Value	Replacement or Supplement	Can be Detected Below Screening
Carbon tetrachloride	300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Chlorobenzene	100	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Chloroethane	NSV	NSV	NSV		
Chloroform	300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Chloromethane	NSV	NSV	NSV		
Cumene	NSV	NSV	NSV		
Cyclohexane	100	USEPA (2000)	Region IV Chronic Screening Value	S	A
Dibromochloromethane	NSV	NSV	NSV		
Dichlorodifluoromethane(Freon-12)	NSV	NSV	NSV		
Ethylbenzene	100	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Methyl acetate	NSV	NSV	NSV		
Methyl-tert-butyl ether (MTBE)	NSV	NSV	NSV		
Methylcyclohexane	NSV	NSV	NSV		
Methylene chloride	300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Styrene	100	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Tetrachloroethene	300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Toluene	100	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Trichloroethene	300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Trichlorofluoromethane(Freon-11)	NSV	NSV	NSV		
Vinyl chloride	300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Xylene, total	100	USEPA (1995)	USEPA Region III BTAG Screening Value		A
cis-1,2-Dichloroethene	300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
cis-1,3-Dichloropropene	300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
m- and p-Xylene	NSV	NSV	NSV		
o-Xylene	NSV	NSV	NSV		
trans-1,2-Dichloroethene	300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
trans-1,3-Dichloropropene	300	USEPA (1995)	USEPA Region III BTAG Screening Value		A

Matrix effects can raise the detection limits of any sample that is not pure water.
The normal analysis reporting limit should _____ meet or be lower than the screening level
A - Always
M - Most of the time
S - Seldom
N - Never
The low concentration CLP methods are only for clean water. The PAHs under semivolatiles can be analyzed by either

NSV - No Screening Value

Table 2 Fresh Water Screening Values					
Chemical	Screening Value	Source of Screening Value	Type of Value	Replacement or Supplement	Can be Detected Below Screening
Inorganics (UG/L)					
Aluminum	25	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Antimony	30.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Arsenic	150	USEPA (2002)	AWQC	R	A
Barium	10,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Beryllium	5.30	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Cadmium	0.09	USEPA (2002)	AWQC (Hardness = 25 mg $CaCO_3$/L)	R	S
Chromium	11	USEPA (2002)	AWQC	R	A
Cobalt	35,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Copper	2.7	USEPA (2002)	AWQC (Hardness = 25 mg $CaCO_3$/L)	R	S
Cyanide	5.2	USEPA (2002)	AWQC	R	S
Iron	1,000	USEPA (2002)	AWQC	R	A
Lead	0.54	USEPA (2002)	AWQC (Hardness = 25 mg $CaCO_3$/L)	R	S
Manganese	14,500	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Mercury	0.77	USEPA (2002)	AWQC	R	A
Nickel	16.1	USEPA (2002)	AWQC (Hardness = 25 mg $CaCO_3$/L)	R	S
Selenium	5.0	USEPA (2002)	AWQC	R	M
Silver	1.00E-04	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Thallium	40.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Vanadium	10,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Zinc	36.5	USEPA (2002)	AWQC (Hardness = 25 mg $CaCO_3$/L)	R	A
Pesticide/Polychlorinated Biphenyls (UG/L)					
4,4'-DDD	0.60	USEPA (1995)	USEPA Region III BTAG Screening Value		A
4,4'-DDE	1,050	USEPA (1995)	USEPA Region III BTAG Screening Value		A
4,4'-DDT	0.0010	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Aldrin	3.00	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Aroclor-1016	0.014	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Aroclor-1221	0.014	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Aroclor-1232	0.014	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Aroclor-1242	0.014	USEPA (1995)	USEPA Region III BTAG Screening Value		N

NSV - No Screening Value

Table 2 Fresh Water Screening Values					
Chemical	Screening Value	Source of Screening Value	Type of Value	Replacement or Supplement	Can be Detected Below Screening
Aroclor-1248	0.014	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Aroclor-1254	0.014	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Aroclor-1260	0.014	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Dieldrin	0.056	USEPA (2002)	AWQC	R	M
Endosulfan I	0.056	USEPA (1995)	USEPA Region III BTAG Screening Value		M
Endosulfan II	0.056	USEPA (1995)	USEPA Region III BTAG Screening Value		M
Endosulfan sulfate	0.056	USEPA (1995)	USEPA Region III BTAG Screening Value		M
Endrin	0.036	USEPA (2002)	AWQC	R	M
Endrin aldehyde	0.0023	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Endrin ketone	0.0023	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Heptachlor	0.0038	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Heptachlor epoxide	0.0038	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Methoxychlor	0.030	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Toxaphene	0.0002	USEPA (1995)	USEPA Region III BTAG Screening Value		N
alpha-BHC	100	USEPA (1995)	USEPA Region III BTAG Screening Value		A
alpha-Chlordane	0.0043	USEPA (1995)	USEPA Region III BTAG Screening Value		N
beta-BHC	100	USEPA (1995)	USEPA Region III BTAG Screening Value		A
delta-BHC	100	USEPA (1995)	USEPA Region III BTAG Screening Value		A
gamma-BHC (Lindane)	0.080	USEPA (1995)	USEPA Region III BTAG Screening Value		M
gamma-Chlordane	0.0043	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Semivolatile Organic Compounds (UG/L)					
1,1-Biphenyl	14	USEPA (1996)	Tier II freshwater screening value	S	S
2,2'-Oxybis(1-chloropropane)	NSV	NSV	NSV		
2,4,5-Trichlorophenol	63.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A
2,4,6-Trichlorophenol	970	USEPA (1995)	USEPA Region III BTAG Screening Value		A
2,4-Dichlorophenol	365	USEPA (1995)	USEPA Region III BTAG Screening Value		A
2,4-Dimethylphenol	2,120	USEPA (1995)	USEPA Region III BTAG Screening Value		A
2,4-Dinitrophenol	150	USEPA (1995)	USEPA Region III BTAG Screening Value		A
2,4-Dinitrotoluene	230	USEPA (1995)	USEPA Region III BTAG Screening Value		A
2,6-Dinitrotoluene	NSV	NSV	NSV		
2-Chloronaphthalene	620	USEPA (1995)	USEPA Region III BTAG Screening Value		A

NSV - No Screening Value

Table 2 Fresh Water Screening Values					
Chemical	Screening Value	Source of Screening Value	Type of Value	Replacement or Supplement	Can be Detected Below Screening
2-Chlorophenol	970	USEPA (1995)	USEPA Region III BTAG Screening Value		A
2-Methylnaphthalene	NSV	NSV	NSV		
2-Methylphenol	13	Suter and Tsao (1996)	Tier II freshwater chronic value	S	M
2-Nitroaniline	NSV	NSV	NSV		
2-Nitrophenol	3,500	USEPA (2000)	Chronic screening value	S	A
3,3'-Dichlorobenzidine	NSV	NSV	NSV		
3-Nitroaniline	NSV	NSV	NSV		
4,6-Dinitro-2-methylphenol	NSV	NSV	NSV		
4-Bromophenyl-phenylether	1.5	USEPA (1996)	Tier II freshwater screening value	S	N
4-Chloro-3-methylphenol	NSV	NSV	NSV		
4-Chloroaniline	50	Buchman (1999)	Freshwater CCC	S	A
4-Chlorophenyl-phenylether	NSV	NSV	NSV		
4-Methylphenol	NSV	NSV	NSV		
4-Nitroaniline	NSV	NSV	NSV		
4-Nitrophenol	150	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Acenaphthene	520	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Acenaphthylene	NSV	NSV	NSV		
Acetophenone	NSV	NSV	NSV		
Anthracene	0.10	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Atrazine	NSV	NSV	NSV		
Benzaldehyde	NSV	NSV	NSV		
Benzo(a)anthracene	6.30	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Benzo(a)pyrene	0.014	USEPA (1996)	Tier II freshwater screening value	S	N
Benzo(b)fluoranthene	NSV	NSV	NSV		
Benzo(g,h,i)perylene	NSV	NSV	NSV		
Benzo(k)fluoranthene	NSV	NSV	NSV		
Butylbenzylphthalate	3.00	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Caprolactam	NSV	NSV	NSV		
Carbazole	NSV	NSV	NSV		
Chrysene	NSV	NSV	NSV		
Di-n-butylphthalate	0.30	USEPA (1995)	USEPA Region III BTAG Screening Value		N

NSV - No Screening Value

Table 2 Fresh Water Screening Values					
Chemical	**Screening Value**	**Source of Screening Value**	**Type of Value**	**Replacement or Supplement**	**Can be Detected Below Screening**
Di-n-octylphthalate	0.30	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Dibenz(a,h)anthracene	NSV	NSV	NSV		
Dibenzofuran	3.7	Suter and Tsao (1996)	Tier II freshwater chronic value	S	N
Diethylphthalate	3.00	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Dimethyl phthalate	3.00	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Fluoranthene	3,980	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Fluorene	430	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Hexachlorobenzene	3.68	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Hexachlorobutadiene	9.30	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Hexachlorocyclopentadiene	5.20	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Hexachloroethane	540	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Indeno(1,2,3-cd)pyrene	NSV	NSV	NSV		
Isophorone	117,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Naphthalene	100	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Nitrobenzene	27,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Pentachlorophenol	15.0	USEPA (2002)	AWQC - based on pH of 7.8	R	A
Phenanthrene	6.30	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Phenol	79.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Pyrene	NSV	NSV	NSV		
bis(2-Chloroethoxy)methane	11,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
bis(2-Chloroethyl)ether	2,380	USEPA (2000)	Chronic screening value	S	A
bis(2-Ethylhexyl)phthalate	30.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A
n-Nitroso-di-n-propylamine	NSV	NSV	NSV		
n-Nitrosodiphenylamine	5,850	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Volatile Organic Compounds (UG/L)					
1,1,1-Trichloroethane	9,400	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,1,2,2-Tetrachloroethane	2,400	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NSV	NSV	NSV		
1,1,2-Trichloroethane	9,400	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,1-Dichloroethane	160,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,1-Dichloroethene	11,600	USEPA (1995)	USEPA Region III BTAG Screening Value		A

NSV - No Screening Value

Table 2 Fresh Water Screening Values					
Chemical	Screening Value	Source of Screening Value	Type of Value	Replacement or Supplement	Can be Detected Below Screening
1,2,4-Trichlorobenzene	50.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,2-Dibromo-3-chloropropane	NSV	NSV	NSV		
1,2-Dibromoethane	18,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,2-Dichlorobenzene	763	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,2-Dichloroethane	20,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,2-Dichloropropane	5,700	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,3-Dichlorobenzene	763	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,4-Dichlorobenzene	763	USEPA (1995)	USEPA Region III BTAG Screening Value		A
2-Butanone	3,220,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
2-Hexanone	428,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
4-Methyl-2-pentanone	460,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Acetone	9,000,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Benzene	5,300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Bromochloromethane	11,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Bromodichloromethane	11,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Bromoform	11,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Bromomethane	NSV	NSV	NSV		
Carbon disulfide	2.00	USEPA (1995)	USEPA Region III BTAG Screening Value		M
Carbon tetrachloride	35,200	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Chlorobenzene	50.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Chloroethane	NSV	NSV	NSV		
Chloroform	1,240	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Chloromethane	NSV	NSV	NSV		
Cumene	NSV	NSV	NSV		
Cyclohexane	NSV	NSV	NSV		
Dibromochloromethane	11,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Dichlorodifluoromethane(Freon-12)	11,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Ethylbenzene	32,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Methyl acetate	NSV	NSV	NSV		
Methyl-tert-butyl ether (MTBE)	NSV	NSV	NSV		
Methylcyclohexane	NSV	NSV	NSV		

NSV - No Screening Value

Table 2 Fresh Water Screening Values					
Chemical	Screening Value	Source of Screening Value	Type of Value	Replacement or Supplement	Can be Detected Below Screening
Methylene chloride	11,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Styrene	NSV	NSV	NSV		
Tetrachloroethene	840	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Toluene	17,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Trichloroethene	21,900	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Trichlorofluoromethane(Freon-11)	11,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Vinyl chloride	11,600	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Xylene, total	6,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
cis-1,2-Dichloroethene	11,600	USEPA (1995)	USEPA Region III BTAG Screening Value		A
cis-1,3-Dichloropropene	244	USEPA (1995)	USEPA Region III BTAG Screening Value		A
m- and p-Xylene	NSV	NSV	NSV		
o-Xylene	NSV	NSV	NSV		
trans-1,2-Dichloroethene	11,600	USEPA (1995)	USEPA Region III BTAG Screening Value		A
trans-1,3-Dichloropropene	244	USEPA (1995)	USEPA Region III BTAG Screening Value		A

Matrix effects can raise the detection limits of any sample that is not pure water.
The normal analysis reporting limit should _____ meet or be lower than the screening level
A - Always
M - Most of the time
S - Seldom
N - Never

NSV - No Screening Value

Table 3
Freshwater Sediment Screening Values

Chemical	Screening Value	Source of Screening Value	Type of Value	Replacement or Supplement	Can be Detected Below Screening
Inorganics (MG/KG)					
Aluminum	25,500	Buchman (1999)	Lowest ARCS (H. azteca) TEL	S	A
Antimony	150	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Arsenic	8.20	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Barium	NSV	NSV	NSV		
Beryllium	NSV	NSV	NSV		
Cadmium	1.20	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Chromium	5.00	USEPA (1995)	USEPA Region III BTAG Screening Value		M
Cobalt	NSV	NSV	NSV		
Copper	34.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Cyanide	NSV	NSV	NSV		
Iron	188,400	Buchman (1999)	Lowest ARCS (H. azteca) TEL	S	A
Lead	46.7	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Manganese	1,673	ORNL (1997C)	ARCS TEC	S	A
Mercury	0.15	USEPA (1995)	USEPA Region III BTAG Screening Value		M
Nickel	20.9	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Selenium	NSV	NSV	NSV		
Silver	1	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Thallium	NSV	NSV	NSV		
Vanadium	NSV	NSV	NSV		
Zinc	150	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Pesticide/Polychlorinated Biphenyls (UG/KG)					
4,4'-DDD	16	USEPA (1995)	USEPA Region III BTAG Screening Value		A
4,4'-DDE	2.20	USEPA (1995)	USEPA Region III BTAG Screening Value		A
4,4'-DDT	1.58	USEPA (1995)	USEPA Region III BTAG Screening Value		M
Aldrin	2	ORNL (1997C)	OMOE LEL	S	A
Aroclor-1016	22.7	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Aroclor-1221	22.7	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Aroclor-1232	22.7	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Aroclor-1242	22.7	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Aroclor-1248	22.7	USEPA (1995)	USEPA Region III BTAG Screening Value		N

NSV - No Screening Value

Table 3 Freshwater Sediment Screening Values					
Chemical	Screening Value	Source of Screening Value	Type of Value	Replacement or Supplement	Can be Detected Below Screening
Aroclor-1254	22.7	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Aroclor-1260	22.7	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Dieldrin	2.85	Buchman (1999)	TEL for freshwater sediment	S	A
Endosulfan I	NSV	NSV	NSV		
Endosulfan II	NSV	NSV	NSV		
Endosulfan sulfate	NSV	NSV	NSV		
Endrin	2.67	Buchman (1999)	TEL for freshwater sediment	S	A
Endrin aldehyde	NSV	NSV	NSV		
Endrin ketone	NSV	NSV	NSV		
Heptachlor	10	NOAA (1999)	NOAA UET	S	A
Heptachlor epoxide	0.6	Buchman (1999)	TEL for freshwater sediment	S	S
Methoxychlor	NSV	NSV	NSV		
Toxaphene	NSV	NSV	NSV		
alpha-BHC	6	ORNL (1997C)	OMOE LEL	S	A
alpha-Chlordane	30	NOAA (1999)	NOAA UET	S	A
beta-BHC	5	ORNL (1997C)	OMOE LEL	S	A
delta-BHC	NSV	NSV	NSV		
gamma-BHC (Lindane)	0.94	Buchman (1999)	TEL for freshwater sediment	S	M
gamma-Chlordane	NSV	NSV	NSV		
Semivolatile Organic Compounds (UG/KG)					
1,1-Biphenyl	NSV	NSV	NSV		
2,2'-Oxybis(1-chloropropane)	NSV	NSV	NSV		
2,4,5-Trichlorophenol	NSV	NSV	NSV		
2,4,6-Trichlorophenol	NSV	NSV	NSV		
2,4-Dichlorophenol	NSV	NSV	NSV		
2,4-Dimethylphenol	29.0	USEPA (1995)	USEPA Region III BTAG Screening Value		N
2,4-Dinitrophenol	NSV	NSV	NSV		
2,4-Dinitrotoluene	NSV	NSV	NSV		
2,6-Dinitrotoluene	NSV	NSV	NSV		
2-Chloronaphthalene	NSV	NSV	NSV		
2-Chlorophenol	NSV	NSV	NSV		

NSV - No Screening Value

Table 3 Freshwater Sediment Screening Values					
Chemical	Screening Value	Source of Screening Value	Type of Value	Replacement or Supplement	Can be Detected Below Screening
2-Methylnaphthalene	70.0	USEPA (1995)	USEPA Region III BTAG Screening Value		N
2-Methylphenol	63.0	USEPA (1995)	USEPA Region III BTAG Screening Value		N
2-Nitroaniline	NSV	NSV	NSV		
2-Nitrophenol	NSV	NSV	NSV		
3,3'-Dichlorobenzidine	NSV	NSV	NSV		
3-Nitroaniline	NSV	NSV	NSV		
4,6-Dinitro-2-methylphenol	NSV	NSV	NSV		
4-Bromophenyl-phenylether	NSV	NSV	NSV		
4-Chloro-3-methylphenol	NSV	NSV	NSV		
4-Chloroaniline	NSV	NSV	NSV		
4-Chlorophenyl-phenylether	NSV	NSV	NSV		
4-Methylphenol	670	USEPA (1995)	USEPA Region III BTAG Screening Value		S
4-Nitroaniline	NSV	NSV	NSV		
4-Nitrophenol	NSV	NSV	NSV		
Acenaphthene	16.0	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Acenaphthylene	44.0	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Acetophenone	NSV	NSV	NSV		
Anthracene	85.3	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Atrazine	NSV	NSV	NSV		
Benzaldehyde	NSV	NSV	NSV		
Benzo(a)anthracene	261	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Benzo(a)pyrene	430	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Benzo(b)fluoranthene	3,200	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Benzo(g,h,i)perylene	670	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Benzo(k)fluoranthene	240	ORNL (1997C)	OMOE LEL	S	N
Butylbenzylphthalate	63.0	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Caprolactam	NSV	NSV	NSV		
Carbazole	NSV	NSV	NSV		
Chrysene	384	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Di-n-butylphthalate	1,400	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Di-n-octylphthalate	6,200	USEPA (1995)	USEPA Region III BTAG Screening Value		A

NSV - No Screening Value

Table 3 Freshwater Sediment Screening Values					
Chemical	Screening Value	Source of Screening Value	Type of Value	Replacement or Supplement	Can be Detected Below Screening
Dibenz(a,h)anthracene	63.4	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Dibenzofuran	540	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Diethylphthalate	200	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Dimethyl phthalate	71.0	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Fluoranthene	600	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Fluorene	19.0	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Hexachlorobenzene	22.0	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Hexachlorobutadiene	11.0	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Hexachlorocyclopentadiene	NSV	NSV	NSV		
Hexachloroethane	NSV	NSV	NSV		
Indeno(1,2,3-cd)pyrene	600	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Isophorone	NSV	NSV	NSV		
Naphthalene	160	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Nitrobenzene	NSV	NSV	NSV		
Pentachlorophenol	360	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Phenanthrene	240	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Phenol	420	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Pyrene	665	USEPA (1995)	USEPA Region III BTAG Screening Value		S
bis(2-Chloroethoxy)methane	NSV	NSV	NSV		
bis(2-Chloroethyl)ether	NSV	NSV	NSV		
bis(2-Ethylhexyl)phthalate	1,300	USEPA (1995)	USEPA Region III BTAG Screening Value		M
n-Nitroso-di-n-propylamine	NSV	NSV	NSV		
n-Nitrosodiphenylamine	28.0	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Volatile Organic Compounds (UG/KG)					
1,1,1-Trichloroethane	31.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,1,2,2-Tetrachloroethane	NSV	NSV	NSV		
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NSV	NSV	NSV		
1,1,2-Trichloroethane	31.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,1-Dichloroethane	NSV	NSV	NSV		
1,1-Dichloroethene	NSV	NSV	NSV		
1,2,4-Trichlorobenzene	40.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A

NSV - No Screening Value

Table 3 Freshwater Sediment Screening Values					
Chemical	Screening Value	Source of Screening Value	Type of Value	Replacement or Supplement	Can be Detected Below Screening
1,2-Dibromo-3-chloropropane	NSV	NSV	NSV		
1,2-Dibromoethane	NSV	NSV	NSV		
1,2-Dichlorobenzene	35.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,2-Dichloroethane	NSV	NSV	NSV		
1,2-Dichloropropane	NSV	NSV	NSV		
1,3-Dichlorobenzene	NSV	NSV	NSV		
1,4-Dichlorobenzene	110	USEPA (1995)	USEPA Region III BTAG Screening Value		A
2-Butanone	NSV	NSV	NSV		
2-Hexanone	NSV	NSV	NSV		
4-Methyl-2-pentanone	NSV	NSV	NSV		
Acetone	NSV	NSV	NSV		
Benzene	NSV	NSV	NSV		
Bromodichloromethane	NSV	NSV	NSV		
Bromoform	NSV	NSV	NSV		
Bromomethane	NSV	NSV	NSV		
Carbon disulfide	NSV	NSV	NSV		
Carbon tetrachloride	NSV	NSV	NSV		
Chlorobenzene	NSV	NSV	NSV		
Chloroethane	NSV	NSV	NSV		
Chloroform	NSV	NSV	NSV		
Chloromethane	NSV	NSV	NSV		
Cumene	NSV	NSV	NSV		
Cyclohexane	NSV	NSV	NSV		
Dibromochloromethane	NSV	NSV	NSV		
Dichlorodifluoromethane(Freon-12)	NSV	NSV	NSV		
Ethylbenzene	10.0	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Methyl acetate	NSV	NSV	NSV		
Methyl-tert-butyl ether (MTBE)	NSV	NSV	NSV		
Methylcyclohexane	NSV	NSV	NSV		
Methylene chloride	NSV	NSV	NSV		
Styrene	NSV	NSV	NSV		

NSV - No Screening Value

Table 3 Freshwater Sediment Screening Values					
Chemical	Screening Value	Source of Screening Value	Type of Value	Replacement or Supplement	Can be Detected Below Screening
Tetrachloroethene	57.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Toluene	NSV	NSV	NSV		
Trichloroethene	NSV	NSV	NSV		
Trichlorofluoromethane(Freon-11)	NSV	NSV	NSV		
Vinyl chloride	NSV	NSV	NSV		
Xylene, total	40.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A
cis-1,2-Dichloroethene	NSV	NSV	NSV		
cis-1,3-Dichloropropene	NSV	NSV	NSV		
m- and p-Xylene	NSV	NSV	NSV		
o-Xylene	NSV	NSV	NSV		
trans-1,2-Dichloroethene	NSV	NSV	NSV		
trans-1,3-Dichloropropene	NSV	NSV	NSV		

Matrix effects can raise the detection limits of any sample that is not pure water.
The normal analysis reporting limit should _____ meet or be lower than the screening level
A - Always
M - Most of the time
S - Seldom
N - Never

NSV - No Screening Value

Table 4 Salt Water Screening Values					
Chemical	Screening Value	Source of Screening Value	Type of Value	Replacement or Supplement	Can be Detected Below Screening
Inorganics (UG/L)					
Aluminum	NSV	NSV	NSV		
Antimony	500	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Arsenic	36.0	USEPA (2002)	AWQC	R	A
Barium	10,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Beryllium	1,500	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Cadmium	8.80	USEPA (2002)	AWQC	R	S
Chromium	50.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Cobalt	NSV	NSV	NSV		
Copper	3.10	USEPA (2002)	AQWC	R	N
Cyanide	1.00	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Iron	NSV	NSV	NSV		
Lead	8.10	USEPA (2002)	AWQC	R	S
Manganese	10.0	USEPA (1995)	USEPA Region III BTAG Screening Value		M
Mercury	0.94	USEPA (2002)	AWQC	R	M
Nickel	8.20	USEPA (2002)	AWQC	R	A
Selenium	71.0	USEPA (2002)	AWQC	R	A
Silver	1.00E-04	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Thallium	2,130	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Vanadium	10,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Zinc	81.0	USEPA (2002)	AWQC	R	A
Pesticide/Polychlorinated Biphenyls (UG/L)					
4,4'-DDD	0.68	USEPA (1995)	USEPA Region III BTAG Screening Value		M
4,4'-DDE	14.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A
4,4'-DDT	0.0010	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Aldrin	1.30	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Aroclor-1016	0.030	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Aroclor-1221	0.030	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Aroclor-1232	0.030	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Aroclor-1242	0.030	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Aroclor-1248	0.030	USEPA (1995)	USEPA Region III BTAG Screening Value		N

NSV - No Screening Value

Table 4 Salt Water Screening Values					
Chemical	Screening Value	Source of Screening Value	Type of Value	Replacement or Supplement	Can be Detected Below Screening
Aroclor-1254	0.030	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Aroclor-1260	0.030	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Dieldrin	0.0019	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Endosulfan I	0.0087	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Endosulfan II	0.0087	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Endosulfan sulfate	0.0087	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Endrin	0.0023	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Endrin aldehyde	0.0023	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Endrin ketone	0.0023	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Heptachlor	0.0036	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Heptachlor epoxide	0.0036	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Methoxychlor	0.030	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Toxaphene	2.00E-04	USEPA (1995)	USEPA Region III BTAG Screening Value		N
alpha-BHC	0.34	USEPA (1995)	USEPA Region III BTAG Screening Value		A
alpha-Chlordane	0.004	USEPA (1995)	USEPA Region III BTAG Screening Value		N
beta-BHC	0.34	USEPA (1995)	USEPA Region III BTAG Screening Value		A
delta-BHC	0.34	USEPA (1995)	USEPA Region III BTAG Screening Value		A
gamma-BHC (Lindane)	0.16	USEPA (1995)	USEPA Region III BTAG Screening Value		M
gamma-Chlordane	0.004	USEPA (2002)	AWQC	S	N
Semivolatile Organic Compounds (UG/L)					
1,1-Biphenyl	NSV	NSV	NSV		
2,2'-Oxybis(1-chloropropane)	NSV	NSV	NSV		
2,4,5-Trichlorophenol	11.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A
2,4,6-Trichlorophenol	NSV	NSV	NSV		
2,4-Dichlorophenol	NSV	NSV	NSV		
2,4-Dimethylphenol	NSV	NSV	NSV		
2,4-Dinitrophenol	4,850	USEPA (1995)	USEPA Region III BTAG Screening Value		A
2,4-Dinitrotoluene	370	USEPA (1995)	USEPA Region III BTAG Screening Value		A
2,6-Dinitrotoluene	NSV	NSV	NSV		
2-Chloronaphthalene	7.50	USEPA (1995)	USEPA Region III BTAG Screening Value		A
2-Chlorophenol	NSV	NSV	NSV		

NSV - No Screening Value

Table 4 Salt Water Screening Values					
Chemical	Screening Value	Source of Screening Value	Type of Value	Replacement or Supplement	Can be Detected Below Screening
2-Methylnaphthalene	300	USEPA (1995)	USEPA Region III BTAG Screening Value		
2-Methylphenol	NSV	NSV	NSV		
2-Nitroaniline	NSV	NSV	NSV		
2-Nitrophenol	NSV	NSV	NSV		
3,3'-Dichlorobenzidine	NSV	NSV	NSV		
3-Nitroaniline	NSV	NSV	NSV		
4,6-Dinitro-2-methylphenol	NSV	NSV	NSV		
4-Bromophenyl-phenylether	NSV	NSV	NSV		
4-Chloro-3-methylphenol	NSV	NSV	NSV		
4-Chloroaniline	29,700	USEPA (1995)	USEPA Region III BTAG Screening Value		A
4-Chlorophenyl-phenylether	NSV	NSV	NSV		
4-Methylphenol	NSV	NSV	NSV		
4-Nitroaniline	NSV	NSV	NSV		
4-Nitrophenol	4,850	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Acenaphthene	710	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Acenaphthylene	300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Acetophenone	NSV	NSV	NSV		
Anthracene	300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Atrazine	NSV	NSV	NSV		
Benzaldehyde	NSV	NSV	NSV		
Benzo(a)anthracene	8.13	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Benzo(a)pyrene	0.21	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Benzo(b)fluoranthene	300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Benzo(g,h,i)perylene	300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Benzo(k)fluoranthene	300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Butylbenzylphthalate	3.40	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Caprolactam	NSV	NSV	NSV		
Carbazole	NSV	NSV	NSV		
Chrysene	300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Di-n-butylphthalate	3.40	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Di-n-octylphthalate	3.40	USEPA (1995)	USEPA Region III BTAG Screening Value		N

NSV - No Screening Value

Table 4 Salt Water Screening Values					
Chemical	Screening Value	Source of Screening Value	Type of Value	Replacement or Supplement	Can be Detected Below Screening
Dibenz(a,h)anthracene	300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Dibenzofuran	NSV	NSV	NSV		
Diethylphthalate	3.40	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Dimethyl phthalate	3.40	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Fluoranthene	16.0	USEPA (1995)	USEPA Region III BTAG Screening Value		M
Fluorene	300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Hexachlorobenzene	129	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Hexachlorobutadiene	32.0	USEPA (1995)	USEPA Region III BTAG Screening Value		M
Hexachlorocyclopentadiene	7.00	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Hexachloroethane	940	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Indeno(1,2,3-cd)pyrene	300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Isophorone	12,900	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Naphthalene	2,300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Nitrobenzene	6,680	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Pentachlorophenol	7.90	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Phenanthrene	4.60	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Phenol	5,800	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Pyrene	300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
bis(2-Chloroethoxy)methane	6,400	USEPA (1995)	USEPA Region III BTAG Screening Value		A
bis(2-Chloroethyl)ether	NSV	NSV	NSV		
bis(2-Ethylhexyl)phthalate	360	USEPA (1995)	USEPA Region III BTAG Screening Value		A
n-Nitroso-di-n-propylamine	NSV	NSV	NSV		
n-Nitrosodiphenylamine	3,300,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Volatile Organic Compounds (UG/L)					
1,1,1-Trichloroethane	31,200	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,1,2,2-Tetrachloroethane	6,230	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NSV	NSV	NSV		
1,1,2-Trichloroethane	31,200	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,1-Dichloroethane	320,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,1-Dichloroethene	224,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,2,4-Trichlorobenzene	129	USEPA (1995)	USEPA Region III BTAG Screening Value		A

NSV - No Screening Value

Table 4 Salt Water Screening Values					
Chemical	Screening Value	Source of Screening Value	Type of Value	Replacement or Supplement	Can be Detected Below Screening
1,2-Dibromo-3-chloropropane	NSV	NSV	NSV		
1,2-Dibromoethane	NSV	NSV	NSV		
1,2-Dichlorobenzene	129	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,2-Dichloroethane	113,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,2-Dichloropropane	3,040	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,3-Dichlorobenzene	NSV	NSV	NSV		
1,4-Dichlorobenzene	129	USEPA (1995)	USEPA Region III BTAG Screening Value		A
2-Butanone	NSV	NSV	NSV		
2-Hexanone	NSV	NSV	NSV		
4-Methyl-2-pentanone	NSV	NSV	NSV		
Acetone	NSV	NSV	NSV		
Benzene	700	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Bromodichloromethane	6,400	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Bromoform	1,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Bromomethane	NSV	NSV	NSV		
Carbon disulfide	2.00	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Carbon tetrachloride	50,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Chlorobenzene	129	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Chloroethane	NSV	NSV	NSV		
Chloroform	815	USEPA (2000)	Chronic screening value	S	A
Chloromethane	NSV	NSV	NSV		
Cumene	NSV	NSV	NSV		
Cyclohexane	NSV	NSV	NSV		
Dibromochloromethane	6,400	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Dichlorodifluoromethane(Freon-12)	6,400	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Ethylbenzene	430	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Methyl acetate	NSV	NSV	NSV		
Methyl-tert-butyl ether (MTBE)	NSV	NSV	NSV		
Methylcyclohexane	NSV	NSV	NSV		
Methylene chloride	6,400	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Styrene	NSV	NSV	NSV		

NSV - No Screening Value

Table 4 Salt Water Screening Values					
Chemical	Screening Value	Source of Screening Value	Type of Value	Replacement or Supplement	Can be Detected Below Screening
Tetrachloroethene	450	USEPA (1995)	USEPA Region III BTAG Screening Value		
Toluene	1,050	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Trichloroethene	2,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Trichlorofluoromethane(Freon-11)	6,400	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Vinyl chloride	224,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Xylene, total	6,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
cis-1,2-Dichloroethene	224,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
cis-1,3-Dichloropropene	790	USEPA (1995)	USEPA Region III BTAG Screening Value		A
m- and p-Xylene	NSV	NSV	NSV		
o-Xylene	NSV	NSV	NSV		
trans-1,2-Dichloroethene	224,000	USEPA (1995)	USEPA Region III BTAG Screening Value		A
trans-1,3-Dichloropropene	790	USEPA (1995)	USEPA Region III BTAG Screening Value		A

Matrix effects can raise the detection limits of any sample that is not pure water.
The normal analysis reporting limit should _____ meet or be lower than the screening level
A - Always
M - Most of the time
S - Seldom
N - Never

NSV - No Screening Value

Table 5 Saltwater Sediment Screening Values					
Chemical	Screening Value	Source of Screening Value	Type of Value	Replacement or Supplement	Can be Detected Below Screening Levels
Inorganics (MG/KG)					
Aluminum	18000	NOAA (1999)	NOAA AET for marine sediment	S	A
Antimony	150	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Arsenic	8.2	USEPA (1995)	USEPA Region III BTAG Screening Value		M
Barium	48	NOAA (1999)	NOAA AET for marine sediment	S	M
Beryllium	NSV	NSV	NSV		
Cadmium	1.2	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Chromium	5	USEPA (1995)	USEPA Region III BTAG Screening Value		M
Cobalt	10	NOAA (1999)	NOAA AET for marine sediment	S	M
Copper	34.0	USEPA (1995)	USEPA Region III BTAG Screening Value		M
Cyanide	NSV	NSV	NSV		
Iron	220000	NOAA (1999)	NOAA AET for marine sediment	S	A
Lead	46.7	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Manganese	260	NOAA (1999)	NOAA AET for marine sediment	S	A
Mercury	0.15	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Nickel	20.9	USEPA (1995)	USEPA Region III BTAG Screening Value		M
Selenium	1	NOAA (1999)	NOAA AET for marine sediment	S	M
Silver	1.00	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Thallium	NSV	NSV	NSV		
Vanadium	57	NOAA (1999)	NOAA AET for marine sediment	S	A
Zinc	150	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Pesticide/Polychlorinated Biphenyls (UG/KG)					
4,4'-DDD	16.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A
4,4'-DDE	2.20	USEPA (1995)	USEPA Region III BTAG Screening Value		A
4,4'-DDT	1.58	USEPA (1995)	USEPA Region III BTAG Screening Value		M
Aldrin	9.5	NOAA (1999)	NOAA AET for marine sediment	S	A
Aroclor-1016	22.7	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Aroclor-1221	22.7	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Aroclor-1232	22.7	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Aroclor-1242	22.7	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Aroclor-1248	22.7	USEPA (1995)	USEPA Region III BTAG Screening Value		S

NSV - No Screening Value

Table 5 Saltwater Sediment Screening Values					
Chemical	**Screening Value**	**Source of Screening Value**	**Type of Value**	**Replacement or Supplement**	**Can be Detected Below Screening Levels**
Aroclor-1254	22.7	USEPA (1995)	USEPA Region III BTAG Screening Value		M
Aroclor-1260	22.7	USEPA (1995)	USEPA Region III BTAG Screening Value		M
Dieldrin	0.715	Buchman (1999)	TEL for marine sediment	S	N
Endosulfan I	NSV	NSV	NSV		
Endosulfan II	NSV	NSV	NSV		
Endosulfan sulfate	NSV	NSV	NSV		
Endrin	0.02	ORNL (1997)	NOAA ER-L for marine sediment	S	N
Endrin aldehyde	NSV	NSV	NSV		
Endrin ketone	NSV	NSV	NSV		
Heptachlor	0.3	NOAA (1999)	NOAA AET for marine sediment	S	S
Heptachlor epoxide	NSV	NSV	NSV		
Methoxychlor	NSV	NSV	NSV		
Toxaphene	NSV	NSV	NSV		
alpha-BHC	NSV	NSV	NSV		
alpha-Chlordane	2.8	NOAA (1999)	NOAA AET for marine sediment	S	A
beta-BHC	NSV	NSV	NSV		
delta-BHC	NSV	NSV	NSV		
gamma-BHC (Lindane)	0.32	Buchman (1999)	TEL for marine sediment	S	N
gamma-Chlordane	NSV	NSV	NSV		
Semivolatile Organic Compounds (UG/KG)					
1,1-Biphenyl	NSV	NSV	NSV		
2,2'-Oxybis(1-chloropropane)	NSV	NSV	NSV		
2,4,5-Trichlorophenol	31	NOAA (1999)	NOAA AET for marine sediment	S	A
2,4,6-Trichlorophenol	61	NOAA (1999)	NOAA AET for marine sediment	S	A
2,4-Dichlorophenol	5	NOAA (1999)	NOAA AET for marine sediment	S	A
2,4-Dimethylphenol	29.0	USEPA (1995)	USEPA Region III BTAG Screening Value		N
2,4-Dinitrophenol	NSV	NSV	NSV		
2,4-Dinitrotoluene	NSV	NSV	NSV		
2,6-Dinitrotoluene	NSV	NSV	NSV		
2-Chloronaphthalene	NSV	NSV	NSV		
2-Chlorophenol	8	NOAA (1999)	NOAA AET for marine sediment	S	A

NSV - No Screening Value

Table 5 Saltwater Sediment Screening Values					
Chemical	Screening Value	Source of Screening Value	Type of Value	Replacement or Supplement	Can be Detected Below Screening Levels
2-Methylnaphthalene	70.0	USEPA (1995)	USEPA Region III BTAG Screening Value		N
2-Methylphenol	63.0	USEPA (1995)	USEPA Region III BTAG Screening Value		N
2-Nitroaniline	NSV	NSV	NSV		
2-Nitrophenol	NSV	NSV	NSV		
3,3'-Dichlorobenzidine	NSV	NSV	NSV		
3-Nitroaniline	NSV	NSV	NSV		
4,6-Dinitro-2-methylphenol	NSV	NSV	NSV		
4-Bromophenyl-phenylether	NSV	NSV	NSV		
4-Chloro-3-methylphenol	NSV	NSV	NSV		
4-Chloroaniline	NSV	NSV	NSV		
4-Chlorophenyl-phenylether	NSV	NSV	NSV		
4-Methylphenol	670	USEPA (1995)	USEPA Region III BTAG Screening Value		S
4-Nitroaniline	NSV	NSV	NSV		
4-Nitrophenol	NSV	NSV	NSV		
Acenaphthene	16.0	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Acenaphthylene	44.0	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Acetophenone	NSV	NSV	NSV		
Anthracene	85.3	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Atrazine	NSV	NSV	NSV		
Benzaldehyde	NSV	NSV	NSV		
Benzo(a)anthracene	261	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Benzo(a)pyrene	430	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Benzo(b)fluoranthene	3,200	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Benzo(g,h,i)perylene	670	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Benzo(k)fluoranthene	NSV	NSV	NSV		
Butylbenzylphthalate	63.0	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Caprolactam	NSV	NSV	NSV		
Carbazole	NSV	NSV	NSV		
Chrysene	384	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Di-n-butylphthalate	1,400	USEPA (1995)	USEPA Region III BTAG Screening Value		M
Di-n-octylphthalate	6,200	USEPA (1995)	USEPA Region III BTAG Screening Value		A

NSV - No Screening Value

Table 5 Saltwater Sediment Screening Values					
Chemical	Screening Value	Source of Screening Value	Type of Value	Replacement or Supplement	Can be Detected Below Screening Levels
Dibenz(a,h)anthracene	63.4	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Dibenzofuran	540	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Diethylphthalate	200	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Dimethyl phthalate	71.0	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Fluoranthene	600	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Fluorene	19.0	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Hexachlorobenzene	22.0	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Hexachlorobutadiene	11.0	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Hexachlorocyclopentadiene	NSV	NSV	NSV		
Hexachloroethane	73	NOAA (1999)	NOAA AET for marine sediment	S	A
Indeno(1,2,3-cd)pyrene	600	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Isophorone	NSV	NSV	NSV		
Naphthalene	160	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Nitrobenzene	NSV	NSV	NSV		
Pentachlorophenol	360	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Phenanthrene	240	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Phenol	420	USEPA (1995)	USEPA Region III BTAG Screening Value		S
Pyrene	665	USEPA (1995)	USEPA Region III BTAG Screening Value		S
bis(2-Chloroethoxy)methane	NSV	NSV	NSV		
bis(2-Chloroethyl)ether	NSV	NSV	NSV		
bis(2-Ethylhexyl)phthalate	1,300	USEPA (1995)	USEPA Region III BTAG Screening Value		A
n-Nitroso-di-n-propylamine	NSV	NSV	NSV		
n-Nitrosodiphenylamine	28.0	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Volatile Organic Compounds (UG/KG)					
1,1,1-Trichloroethane	31.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,1,2,2-Tetrachloroethane	NSV	NSV	NSV		
1,1,2-Trichloro-1,2,2-trifluoroethane(Freon-113)	NSV	NSV	NSV		
1,1,2-Trichloroethane	31.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,1-Dichloroethane	NSV	NSV	NSV		
1,1-Dichloroethene	NSV	NSV	NSV		
1,2,4-Trichlorobenzene	40.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A

NSV - No Screening Value

Table 5 Saltwater Sediment Screening Values					
Chemical	Screening Value	Source of Screening Value	Type of Value	Replacement or Supplement	Can be Detected Below Screening Levels
1,2-Dibromo-3-chloropropane	NSV	NSV	NSV		
1,2-Dibromoethane	NSV	NSV	NSV		
1,2-Dichlorobenzene	35.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A
1,2-Dichloroethane	NSV	NSV	NSV		
1,2-Dichloropropane	NSV	NSV	NSV		
1,3-Dichlorobenzene	NSV	NSV	NSV		
1,4-Dichlorobenzene	110	USEPA (1995)	USEPA Region III BTAG Screening Value		A
2-Butanone	NSV	NSV	NSV		
2-Hexanone	NSV	NSV	NSV		
4-Methyl-2-pentanone	NSV	NSV	NSV		
Acetone	NSV	NSV	NSV		
Benzene	NSV	NSV	NSV		
Bromodichloromethane	NSV	NSV	NSV		
Bromoform	NSV	NSV	NSV		
Bromomethane	NSV	NSV	NSV		
Carbon disulfide	NSV	NSV	NSV		
Carbon tetrachloride	100	NOAA (1999)	NOAA AET for marine sediment	S	A
Chlorobenzene	100	NOAA (1999)	NOAA AET for marine sediment	S	A
Chloroethane	NSV	NSV	NSV		
Chloroform	NSV	NSV	NSV		
Chloromethane	NSV	NSV	NSV		
Cumene	NSV	NSV	NSV		
Cyclohexane	NSV	NSV	NSV		
Dibromochloromethane	NSV	NSV	NSV		
Dichlorodifluoromethane(Freon-12)	NSV	NSV	NSV		
Ethylbenzene	10.0	USEPA (1995)	USEPA Region III BTAG Screening Value		N
Methyl acetate	NSV	NSV	NSV		
Methyl-tert-butyl ether (MTBE)	NSV	NSV	NSV		
Methylcyclohexane	NSV	NSV	NSV		
Methylene chloride	NSV	NSV	NSV		
Styrene	100	NOAA (1999)	NOAA AET for marine sediment	S	A

NSV - No Screening Value

Table 5 Saltwater Sediment Screening Values					
Chemical	Screening Value	Source of Screening Value	Type of Value	Replacement or Supplement	Can be Detected Below Screening Levels
Tetrachloroethene	57.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A
Toluene	NSV	NSV	NSV		
Trichloroethene	NSV	NSV	NSV		
Trichlorofluoromethane(Freon-11)	NSV	NSV	NSV		
Vinyl chloride	NSV	NSV	NSV		
Xylene, total	40.0	USEPA (1995)	USEPA Region III BTAG Screening Value		A
cis-1,2-Dichloroethene	NSV	NSV	NSV		
cis-1,3-Dichloropropene	NSV	NSV	NSV		
m- and p-Xylene	NSV	NSV	NSV		
o-Xylene	NSV	NSV	NSV		
trans-1,2-Dichloroethene	NSV	NSV	NSV		
trans-1,3-Dichloropropene	NSV	NSV	NSV		

Matrix effects can raise the detection limits of any sample that is not pure water.
The normal analysis reporting limit should _____ meet or be lower than the screening level
A - Always
M - Most of the time
S - Seldom
N - Never

NSV - No Screening Value